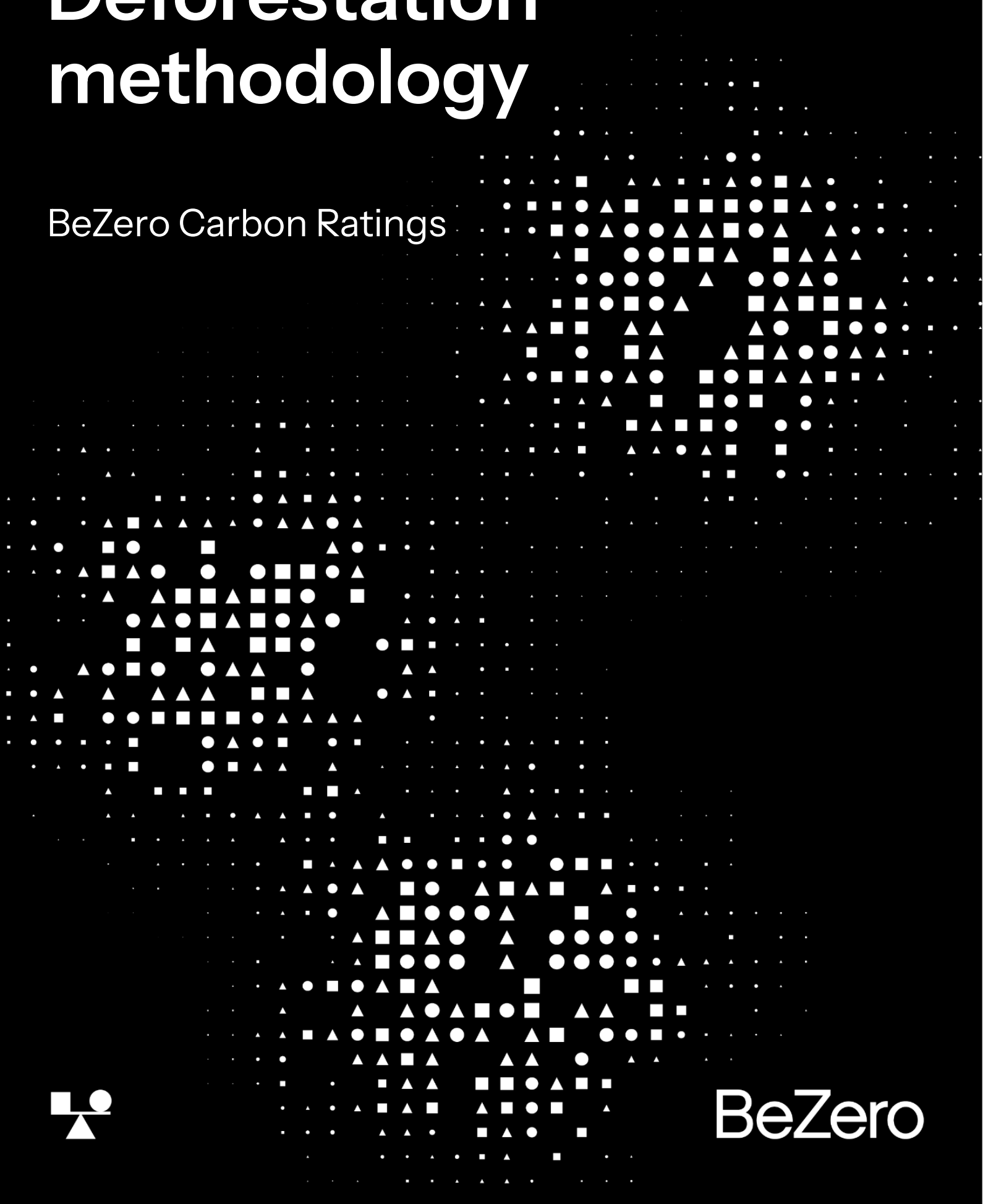
Avoided Deforestation methodology

BeZero Carbon Ratings



BeZero

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Glossary

Additional sub-sector qualifiers: The classification labels BeZero applies within a sub-sector to determine the appropriate analytical approach for a given project. For Avoided Deforestation, the primary qualifiers are Avoided Unplanned Deforestation (AUD) and Avoided Planned Deforestation (APD).

Avoided Planned Deforestation (APD): Projects that aim to stop deforestation that is both legally authorised and officially documented, where there is verifiable evidence that forest conversion was predestined and feasible, and where the agent of deforestation is clearly identified and is often the landowner.

Avoided Unplanned Deforestation (AUD): Projects that aim to stop deforestation that would otherwise occur without prior authorisation or planning. Deforestation in these projects tends to be illegal and may stem from a variety of drivers and agents that are not clearly defined.

Baseline: A baseline scenario is the amount of emissions that are assumed to occur in the absence of any project intervention.

BeZero Carbon Rating (BCR): The BeZero Carbon Rating is a hybrid analytical framework that fuses financial, scientific, and policy-based analysis. It provides an opinion on the likelihood that a given credit achieves a tonne of CO_2e avoided or removed.

Buffer pool: The buffer pool is an account of non-tradable credits that projects contribute towards and which serves as a communal reserve for Nature Based Solutions. Contribution amounts are based on the methodology. If a project loses its carbon stocks, for example to fire or disease, buffer pool credits can be used to compensate for the loss. Alternatively, projects that effectively mitigate the risk of carbon loss can regain the credits they contributed to the buffer pool.

Carbon finance: Financial resources allocated to carbon project activities that reduce or avoid greenhouse gas emissions. It is an additional source of revenue that seeks to make such activities more financially viable.

Carbon pool: Ecosystem components that have the capacity to release, sequester and/or store carbon. These include above- and below-ground biomass, soil organic carbon, soil inorganic carbon, deadwood, litter and harvested wood products.

Commitment period: The duration of time over which a project plans for its activities to take place, and over which permanence risk is assessed.

Deforestation: The intentional clearing of forests that results in changes in land cover classification.

Degradation: The loss or damage to forests that is small-scale and insufficient to change land cover classification, leaving land with the potential to recover.

Ex ante rating: A rating of the carbon efficacy of credits that are yet to be issued from a project, based on planned activities and available documentation rather than observed monitoring data.

Ex post rating: A rating of the carbon efficacy of credits that have already been issued from a project, informed by observed and reported monitoring data across the rated vintage or vintages.

Leakage belt: An area surrounding or close to (but not overlapping with) the project area, which may be vulnerable to leakage, for example due to the displacement of deforestation drivers. The nature of the leakage belt is dependent on the type and scale of leakage risks identified for the project.

Methodology: A framework that sets out a process and parameters for quantifying a project's carbon benefits. Methodologies enable project developers to quantify baselines, assess key aspects like

additionality, and define necessary monitoring practices to ensure the greenhouse gas emission reductions are verifiable, additional, and quantified.

Nature-Based Solutions (NBS): Nature-Based Solutions projects aim to achieve emission removals or avoidance in the natural environment; these include forestry, soil carbon, and blue carbon.

Project area: The geographical boundaries within which project activities take place.

Rating Committee: A group of members with extensive experience within and across all sectors who discuss and debate the assignment of ratings. The Rating Committee oversees the analytical process and ensures consistency in the application of rating criteria, methodologies, and comparability of ratings across sectors and countries.

REDD+: Reducing Emissions from Deforestation and Forest Degradation, a framework established to enhance forest carbon stocks in developing countries through the prevention of deforestation and degradation and the sustainable management of forests.

Reference region: An area, chosen for its similarity to the project area, used to determine a baseline for project activities. Reference regions may be used to project the rate of deforestation and/or the likely location of deforestation.

Stakeholders: Individuals and/or groups of people who may be affected by a project's implementation and activities.

Standards bodies: Organisations that develop and revise methodologies to determine the greenhouse gas benefits of various types of carbon projects, and inform when and how many credits projects can issue.

Vintage: The vintage year refers to the period during which the emission reduction or removal associated with a credit occurred.

Voluntary Carbon Market (VCM): Carbon markets that exist outside of the regulation and frameworks of international agreements, and are fuelled by the commitments of individuals, as well as private and public organisations, to reduce GHG emissions through the trading of carbon credits.

Introduction

BeZero Carbon is a global ratings agency for the carbon market. Our ratings provide a publicly available, risk-based framework for assessing carbon efficacy. We rate qualifying carbon credits in all sectors.

We take a research-first mindset, fusing traditional capital markets research practices with expertise in environmental sciences and technology. We think creatively about climate problems and build solutions the whole market can use.

We have developed extensive analytical frameworks to rate carbon credits on their likelihood of delivering on their promised carbon emissions avoidance or removal. These analytical frameworks are deeply sector nuanced and bring to the fore our extensive experience in rating hundreds of projects across dozens of sub-sectors.

Our Ratings, Geospatial, Data, and Research teams are made up of dozens of climate and data scientists, geospatial experts and financial market analysts. They bring with them the highest academic and industry credentials, a tenacious approach to scientific inquiry and a dedication to climate action through science. They hold PhDs and qualifications in disciplines from remote sensing, forest ecology, ecosystem disturbance, peatlands, and blue carbon to statistics, machine learning, artificial intelligence, financial research, industrial engineering, and public policy. They have

published hundreds of academic papers and have been cited tens of thousands of times in peer-reviewed scientific academic literature.

As the market's number one risk metric, our ratings are available on our website and dozens of marketplaces, and alongside extensive analysis and research on our BeZero Carbon Markets platform.

What is Avoided Deforestation?

Avoided deforestation is the practice of preventing forest clearance relative to a baseline in which deforestation would otherwise occur, thereby maintaining forest carbon stocks and avoiding associated emissions. BeZero Carbon's Avoided Deforestation (AD) methodology is a tool for users of the BeZero Carbon Rating to better understand our analytical approach to the sub-sector.

In the Forestry sector, credit issuance can be broadly classified as either emissions avoidance or carbon removals. Avoidance credits are primarily generated through Avoided Deforestation, Jurisdictional REDD+ and Forested Peatlands, while removal credits are primarily generated through Afforestation, Reforestation & Restoration (ARR) and Improved Forest Management (IFM). Improved Forest Management aims to increase net carbon stocks in production forests through changes in forest management practices, whereas Avoided Deforestation focuses on protecting forests threatened with conversion to other land uses.

Under the BeZero Sector Classification system, in the BeZero Sector Classification system, Avoided Deforestation is one of five Forestry sub-sectors within the Nature-Based Solutions (NBS) sector group, alongside ARR, IFM, Jurisdictional REDD+ and Forested Peatlands (Figure 1). Projects classified under Forested Peatlands are typically assessed using the Avoided Deforestation methodology, where their primary crediting activity involves preventing deforestation and associated emissions.

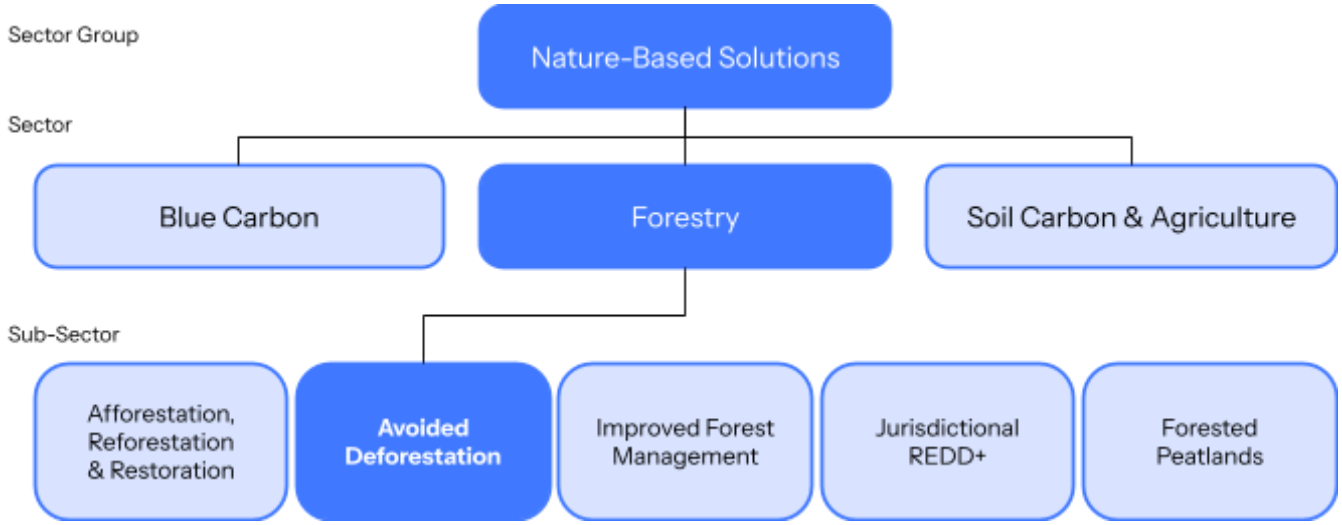


Figure 1. The location of the AD sub-sector within BeZero's Sector Classification System.

Avoided Deforestation can be summarised as a set of activities that prevent the clearing or conversion of standing forest that would otherwise occur, avoiding the greenhouse gas emissions associated with that forest loss when compared to a counterfactual scenario in which the project does not take place. Because the credited outcome is deforestation that does not occur, rather than a change in ongoing forest management, the central analytical task is to establish what would have happened to the project area without the project and whether the project's activities can credibly explain why it did not.

Additional sub-sector qualifiers for Avoided Deforestation

Avoided Deforestation projects vary substantially in the nature of the deforestation threat they address, and this has a material bearing on how we assess carbon efficacy risk. To determine our approach at the most basic level, we classify projects using two qualifiers: Avoided Unplanned Deforestation (AUD) and Avoided Planned Deforestation (APD).

AUD projects aim to stop deforestation that would otherwise occur without prior authorisation or planning. The threat is often illegal, and the drivers and agents responsible for it are often diffuse and not clearly defined — ranging from smallholder agricultural expansion to organised land-grabbing, illegal logging, or mining. Establishing whether and to what extent deforestation would occur absent the project, and by whom, is often the central analytical challenge for these projects.

APD projects aim to stop deforestation that is both legally authorised and officially documented. There is typically verifiable evidence that forest conversion was planned and feasible — for example, an approved land-use change permit, a concession agreement, or a documented conversion plan — and the agent responsible is clearly identified, often the landowner itself. Because the counterfactual is grounded in a specific, identifiable plan rather than a diffuse threat, the analytical emphasis for APD projects shifts towards the credibility of that plan and the standing of the agent behind it, rather than towards establishing that a threat exists at all.

This distinction matters analytically because it changes where risk is concentrated and how it is evidenced. For AUD projects, additionality risk is closely tied to whether a genuine, imminent deforestation threat can be established and to whether the project's own activities can be shown to have suppressed it. For APD projects, additionality risk is more closely tied to the legal and financial credibility of the specific baseline agent and their documented plan, and to whether that plan would have proceeded without carbon finance. We find that these different threat models also tend to produce different risk profiles in carbon accounting and permanence: for example, baseline-setting approaches for AUD projects typically rely on historical deforestation trends and statistically matched counterfactuals, whereas APD baselines are more often anchored to a specific, documented conversion plan and rate. Throughout this document we treat AUD and APD side by side within each risk driver, noting where the two require different analytical treatment and where they do not.

This document, together with our Avoided Deforestation methodology in practice document, sets out our detailed analytical framework for the Avoided Deforestation sub-sector. It presents an extension to our overarching BeZero Carbon Rating Methodology, which details our risk-based assessment framework for understanding and interrogating the carbon efficacy of credits of any type, in any sector and country, and to our BeZero Carbon Ex Ante Rating Methodology, which sets out our framework for assessing the carbon efficacy of credits yet to be issued. Important elements of the BeZero Carbon rating process that are common to all sectors are described in those documents and are not repeated here. These include:

- The steps in the rating process, and how ex post and ex ante ratings differ at a process level
- The project governance assessment
- Project boundary auditing
- Assessing the risk of double counting
- The integrity of reported issuance
- Assessing rating eligibility
- The rating assignment process
- The role of the BeZero Carbon Rating Committee
- Ongoing monitoring and our rating watch process

BeZero Carbon Rating analytical framework and process for AD

We have designed an approach to assessing the carbon efficacy risk for issued carbon credits. This framework is applicable to any project type in any sector accredited by any standards body, and leverages a blend of qualitative and quantitative factors; financial, environmental, and policy assessment techniques; and primary and secondary data sources.

Our BeZero Carbon Rating Methodology details our risk-based assessment for understanding and interrogating the efficacy of issued carbon credits of any type, in any sector and country.

The BeZero Carbon ex ante Rating Methodology similarly describes our framework for assessing the carbon efficacy of credits yet to be issued from projects of any type, in any sector and country. Ex ante ratings will also consider project execution risk.

Sector methodologies can be seen as nested within the overarching ex post or ex ante methodologies. The overall rating definitions, risk factors and risk driver categories are common across all projects, while the sector methodologies complement the overarching methodologies.

This document provides an extension to our overarching rating methodologies. It presents BeZero's detailed analytical framework and process for AD projects. It showcases the various parameters through which we assess risk to the carbon quality of these credits, and how this sub-sector relates back to our overarching rating methodologies.

Holistic assessment

The assessment of a carbon credit's efficacy includes a detailed, project-specific, bottom-up, and top-down analysis to provide a comprehensive assessment of risk. Further details on the risk factor definitions, the rating process, and the overall risk assessment can be found in our BeZero Carbon Rating Methodology. For pre-issuance ratings, please consult the BeZero Carbon ex ante Rating Methodology.

Important elements of the BeZero Carbon rating process that are applicable to all project types are described in detail in these documents (but not repeated in this document). These include:

- The steps in the rating process
- The project governance assessment
- Project boundary auditing
- Assessing the risks of double counting
- The integrity of reported issuance
- Assessing rating eligibility (whether projects meet our three primary qualifying criteria)
- The rating assignment process
- The role of the BeZero Carbon Rating Committee
- Ongoing monitoring and 'rating watch' process

Geospatial and Earth Observation

For all NBS projects, data and analysis from our Geospatial and Earth Observation team form a core part of the analytical process. The team draws on a diverse set of data inputs, including but not limited to airborne and spaceborne LiDAR, synthetic-aperture radar, and multispectral measurements, with spatial resolutions ranging from centimetres to kilometres, and temporal frequency and coverage from days to decades.

Other geospatial inputs include data on road and river networks, human demographics, land ownership and governance, soil and climate data, and biodiversity. We also draw on our extensive

database of ground-measured carbon, spanning thousands of forest inventory sites globally. These geospatial data are combined in statistical and machine learning frameworks to inform project- and vintage-level risk associated with common practice, over-crediting, leakage and non-permanence.

The BeZero Carbon Rating reflects the balance of evidence across all types of information, geospatial or otherwise. Subject to project-specific characteristics and evidence, our geospatial analysis may not be paramount in the final rating view if, for example, financial, policy, or other analysis is deemed more decisive. In all cases, non-spatial data (e.g. buffer pool contributions) provide essential context.

Three geospatial capabilities are central to our current AD analysis and are referred to throughout this document.

1. **Statistically-matched dynamic baselines.** This technique is used only for AUD projects. We construct a counterfactual for the project area by matching each forest pixel within it to control pixels in the wider landscape. Controls are selected so as to be similar to the project area in all relevant observable respects, including land ownership class, land designation, jurisdiction, topography, and forest characteristics, and to be subject to similar pressures, but to have no carbon project intervention. Because there is no perfect set of controls, we repeat the matching process many times to characterise uncertainty, and we track outcomes in matched pairs through time. For AUD, we use this approach in two ways: to compare observed deforestation inside and outside the project area, and to establish the counterfactual rate of forest loss against which the project's own baseline is assessed. This procedure is led at every stage by our geospatial and ratings analysts, so that models do not become black boxes, and analyst feedback is incorporated to ensure conclusions are grounded in ecological reality and in the local context of the project being assessed.

2. **High-frequency forest carbon and structure monitoring.** Through our partnership with Planet Labs and Chloris Geospatial, we use Forest Carbon Diligence and Forest Carbon Monitoring products to observe canopy cover, canopy height and aboveground carbon density at high spatial resolution and regular temporal frequency. This allows us to detect not only stand-replacing deforestation but also partial-canopy events such as selective logging, which are poorly captured by conventional tree cover loss products and which are central to assessing degradation, or thinning. We are explicit about the limitations of these data: they capture stand-replacing deforestation considerably better than they capture degradation associated with partial canopy loss. Where we rely on them to assess degradation, we do so qualitatively and in combination with other evidence, rather than treating them as a precise measure of degradation-related carbon loss. We also note that these products use the following year's observations to bias-correct the current year, so the most recent year in a series can exhibit spurious variation and is interpreted with corresponding caution.

3. **Forest inventory integration.** We maintain the BeZero Carbon Plots Database, which combines ground-measured carbon from private collections, national inventories, international plot networks, academic studies and research partnerships, spanning more than 300,000 sites across all six forested continents as of January 2025. It harmonises stem-level estimations of tree volume and species-specific wood density, linked with allometries, geospatial information and our market data. For Avoided Deforestation, we use it to compare carbon stock values in plots near the project area against the carbon stock value applied by the project. Where nearby plots are absent or unreliable, our analysis is driven by literature values and, where appropriate, remote sensing.

The BeZero Carbon Rating reflects the balance of evidence across all types of information, geospatial or otherwise. Subject to project-specific characteristics and evidence, our geospatial analysis may not be paramount in the final rating view if, for example, financial, policy or other analysis is deemed more decisive. In all cases, non-spatial data — for example buffer pool contributions — provide

essential context. Where the quality of matching or of the underlying data is insufficient to support a conclusion, we say so and weigh the evidence accordingly rather than relying on it.

Carbon efficacy assessment

Whilst the foundational questions that underpin a BeZero Carbon Rating converge at the risk factor level, the inputs used to answer these questions show increasing specificity at the sub-sector and project levels.

Additionality

'The risk that a credit purchased and retired does not lead to a tonne of CO_2e being avoided or sequestered that would not have otherwise happened.'

Whilst the foundational questions that underpin a BeZero Carbon Rating converge at the risk factor level, the inputs used to answer these questions show increasing specificity at the sub-sector and project levels.

Table 3 sets out the risk drivers within our assessment of additionality. In the sections that follow we detail the key parameters that factor into each level of risk assessment.

Table 3. Sub-components of additionality assessed.

Risk factor	Risk driver category	Risk driver
Additionality	Activity analysis	Common practice
		Alternatives to the proposed project
		Project effectiveness
	Financial analysis	Investment analysis
	Legal and policy	Policy support

Activity Analysis

Common practice

Common practice is a major driver of our additionality analysis for AD projects. Our objective is to determine whether the project's forest protection activities are already common and effective elsewhere in the region, in the absence of carbon finance. If comparable land is already effectively protected, if similar protective activities are undertaken elsewhere without carbon finance, or if deforestation threats on comparable land are minimal, then the project is less likely to be additional.

We assess common practice by identifying land in the same jurisdiction, under comparable land tenure and governance, and facing comparable land-use pressure to the project area, and examining whether forest there has persisted without carbon finance and by what means. To ensure that we examine a regional land base that is comparable to the project area, we draw on the World Database on Protected Areas, national and regional conservation datasets, our internal geospatial layers on protected area coverage, and a literature review for forms of protection — such as informally managed conservation areas — that may not be captured in formal databases, as well as our extensive internal database of spatial boundaries for known carbon projects. Where a project area or comparable land benefits from protected status, we assess the effectiveness of that protection using

observed forest loss within it, since designation alone does not guarantee protection in practice, and we consider whether that protection is itself at risk of being downgraded, downsized or degazetted.

We separately assess whether the specific activities a project undertakes — for example ranger patrols, boundary demarcation, or community livelihood programmes — are unusual on lands under similar ownership or governance arrangements in the jurisdiction, and whether comparable activities have already been attempted and with what success. Prior activity funded by grants, aid, or non-governmental organisations is not treated as evidence against additionality in itself; carbon finance can represent a more durable source of funding than donor-dependent alternatives, and the relevant question is whether the specific activities proposed would occur at the same scale absent carbon finance.

For AUD projects, this assessment for ex post ratings draws on monitoring reports and independently verified project documentation to establish what has actually been implemented to date. For ex ante ratings, in the absence of an implementation record, we assess the activities the project proposes to undertake as set out in its documentation, testing them against the same common-practice evidence base.

For APD projects, we also assess whether comparable landowners in a similar legal position have chosen not to exercise a conversion right they hold. The relevant comparator is not only whether forest has been protected, but whether authorised conversion has actually taken place on similar, legally convertible land, and how common such conversion is within the project region.

We recognise the limits of this analysis. In some cases, a project's context is too unusual for a common-practice assessment to be informative — for example, when there are few or no comparable landowners in the region, so any comparison would be to landowners facing materially different pressures and incentives regardless of carbon finance. In such cases, we state the limitation and weigh the remaining evidence accordingly.

Alternatives to the proposed project

Another key aspect of additionality assessments is understanding the likelihood and extent of the alternative scenarios that may occur in the absence of a project. Our objective is to identify realistic land-use scenarios that could occur in the project area in the absence of the project, and to determine the range of credible alternatives. The project's own stated baseline is one source of evidence, but it does not constrain the alternatives we consider; we test it against the wider set of realistic scenarios we identify.

For AUD projects, the analyses involve identifying the candidate drivers of deforestation in the absence of the project: for example, agricultural expansion, timber extraction, mining, infrastructure development, or subsistence pressure from population growth. We assess the credibility and timing of each candidate driver using historical land-use patterns within and around the project area over the years preceding the project; trends in land-use and land-cover change across a wider surrounding area and jurisdiction; and literature and third-party data on the profitability and prevalence of the relevant land uses. A key judgement is whether an identified threat was genuinely imminent to the project area within the rated period — a project can sit within a broader region under active deforestation pressure without any specific threat having reached its boundary yet, in which case activities to date may not appear very additional even where the underlying threat is real.

For APD projects, the equivalent assessment centres on the credibility of the specific baseline conversion plan and the agent behind it — including whether the necessary permits, licences or approvals for conversion have been obtained or are likely to be obtained, whether the agent has the legal and financial capacity to carry out the plan, and whether independent evidence corroborates the plan's specifics (timing, scale, and land use) beyond the project's own account. Where a baseline

plan has not yet been formally approved, we assess the likelihood of approval based on the regulatory context and any observable precedent.

Across both qualifiers, "forest protection without carbon finance" is always considered as a candidate alternative scenario. Where a project's baseline otherwise resembles a continuation of prior practice, we weigh evidence of a change in circumstances, such as a change in land ownership or a shift in market conditions.

Project effectiveness

The extent to which project activities are effectively implemented is a component of our additionality assessment for AD projects, and applies mainly to ex post ratings. This driver carries more weight for AUD than for APD, since AUD's threat is diffuse and ongoing, so additionality can only be demonstrated through a sustained pattern of avoided deforestation over time, whereas APD's baseline is anchored to a specific conversion plan, so effectiveness is more directly evidenced by whether that plan proceeded.

Our objective is to determine whether project activities have avoided deforestation relative to the counterfactual, and whether any reduction in forest loss can be attributed to those activities rather than unrelated factors. Where a project has been effective, the landowner is forgoing more of the value they would have gained from converting the land, and this forgone value strengthens the case that carbon finance was needed.

For AUD, we rely primarily on geospatial observation, comparing levels and patterns of deforestation within the project area since implementation against those observed in matched control pixels. Where trends before and after implementation are inconclusive over the rated period, we say so rather than inferring effectiveness in either direction. In interpreting forest change data, we consider its accuracy for the forest type and geography in question, including through visual inspection of imagery and benchmarking against other products. We treat detections of thinning with particular care, since apparent canopy thinning can arise from other causes such as drought.

Financial Analysis

Prior consideration of carbon finance

This risk driver is typically not applicable for AD projects. The material question for this sub-sector is whether a project's ongoing implementation depends on carbon finance, and we address questions of whether carbon finance was contemplated before implementation began under *Investment analysis*.

Investment analysis

Our objective is to determine whether the project's implementation is dependent on carbon finance. If the project's activities are financially attractive, or would proceed at a similar scale and pace in the absence of carbon finance, then the project is unlikely to be additional.

For AD projects, the analysis is framed around opportunity cost. The relevant comparison is between the net present value of the counterfactual land use and that of the project scenario without carbon finance; the difference is the opportunity cost the project must overcome. We then assess how far carbon revenues close that gap. Where the opportunity cost is small, or carbon finance covers only a small share of it, additionality risk is elevated. Where the opportunity cost is high, and carbon finance covers most of it, additionality risk is reduced. This opportunity cost is often high for forest conservation projects, since converting forest to agriculture, pasture or timber typically yields much greater near-term returns than standing forest.

For AUD, the counterfactual is often not tied to a specific investment case, so we estimate opportunity cost from regional benchmarks for the relevant land use. For APD, the baseline agent's documented conversion plan specifies the intended land use and scale, which lets us estimate opportunity cost more precisely than for AUD, where the counterfactual land use is less well defined.

Where the project has provided its own financial analysis, we assess its assumptions against independent third-party sources and, where a sufficient breakdown is available, try to replicate its results using externally corroborated inputs. We consider standard investment metrics such as internal rate of return and payback period, with and without carbon revenue, benchmarked against literature values for comparable land uses and geographies. Most projects do not provide a detailed financial analysis, so this assessment is often more limited where documentation is scarce, particularly where there is no material prior or alternative economic activity in the project area to interrogate.

For ex ante ratings, this analysis draws on projected rather than realised costs, revenues and carbon pricing, and depends more on the plausibility of the project's own forward-looking assumptions, tested against independent benchmarks in the same way.

We also note that some entities have strong non-financial reasons for protecting forests. Therefore, demonstrating that forest conversion is financially attractive does not automatically imply that the project is additional.

Legal and policy

Policy support

Our objective is to determine the extent to which existing policies, incentives and mandates encourage or require the project activities in the absence of carbon finance. Projects in jurisdictions that benefit from robust, effectively-enforced policy environments which reduce barriers to implementation are likely to present higher additionality risk. Conversely, carbon finance may be essential to a project's successful implementation where relevant policies are weak, poorly enforced, or actively undermine project activities.

Our approach for AD focuses only on those policies which directly bear on forest conservation decisions. Broader policy considerations are addressed in our overarching rating methodology and, where they affect double counting, through the separate assessment of that risk described there.

We identify supportive policies, incentives and mandates relevant to the project at the national, subnational and local levels, such as conservation requirements, payment-for-ecosystem-services schemes, or blacklisting regimes tied to deforestation-linked commodities, and threatening policies such as agricultural expansion or infrastructure targets. We assess the track record of enforcement, uptake and documented outcomes for each, and the extent to which the specific project benefits from or is constrained by them. Our approach focuses on policy that bears directly on forest conservation and land-use decisions in the project area. Broader climate policy considerations, including alignment with national climate commitments, are addressed in our overarching rating methodology.

The practical significance of a given policy instrument to an individual landowner is often not evident from formal descriptions of the policy, including the text of relevant laws and regulations. Each policy identified is therefore assessed with input from analysts with experience of the relevant jurisdiction, and we are explicit where a policy's status or effect on forest management decisions is uncertain.

Carbon Accounting

The likelihood that or degree to which climate benefits are accurately or conservatively quantified.

Table 4 sets out the risk drivers within our assessment of carbon accounting.

Table 4. Sub-components of our over-crediting assessment.

Risk factor	Risk driver category	Risk driver
Carbon Accounting	Direct accounting	Baseline scenario
		Project scenario
		GHG conversions
	Leakage accounting	Activity displacement
		Market leakage

Reconstructing the project's crediting structure

Our assessment of carbon accounting begins by reconstructing how a project arrived at its net issuance across the rated vintage period, so that the effect of each subsequent finding can be located within that structure.

Using project-reported values, we establish the project's total gross emissions reductions as the difference between project-area carbon stocks under the baseline and project scenarios. We then decompose that difference into its main accounting components, since each is subject to distinct risks. Baseline emissions reflect the carbon losses assumed to occur through deforestation or degradation in the absence of the project, based on assumptions about the extent of forest loss and the carbon stocks affected. Project emissions reflect the carbon losses that occur in the project area under the project scenario. From gross emissions reductions, we then account for the project's leakage deduction and buffer pool contribution to arrive at claimed net emissions reductions.

Separately, we construct the equivalent quantities on our own terms to obtain our best estimate range for comparison. Where our analysis of the risk drivers below leads us to a different view of the counterfactual rate and extent of deforestation, the carbon stocks affected, reported project emissions, or the appropriate leakage deduction, we quantify the emissions reductions that our own assumptions would imply, and arrive at a BeZero view of net emissions reductions for the rated vintages. The proportion of the project's claimed net issuance that our analysis does not support is the central output of our carbon accounting assessment, and the primary determinant of the risk factor score.

Three points of method follow from this. First, quantification is attempted wherever the evidence permits it, including where we conclude that a project's accounting is conservative rather than aggressive. Second, non-trivial assumptions are sometimes unavoidable. Third, in many cases we also need to consider the range and shape of uncertainty, strength of the scientific consensus that underpins the estimations, the likelihood of other unknowns, and other more qualitative considerations. Where the evidence supports a range rather than a point estimate, we present a range, and in conditions of material uncertainty we prefer to do so.

Baseline scenario

The project's applied baseline is the rate and pattern of forest loss assumed to occur in its absence. Our objective is to determine whether this is conservative with respect to the range of possible counterfactuals, and where it is not, to characterise the extent of the divergence. This differs from

the baseline question under Additionality, which asks whether the counterfactual scenario qualitatively differs from the project scenario; here we quantify the likely rate and scale of deforestation in the counterfactual and consider the quantitative implications for carbon accounting.

For AUD projects, baseline-setting often relies on historical deforestation trends in the project area or in a reference region selected to represent it. We evaluate the parameters of the project's baseline model, the length and representativeness of its historical period, and, where applicable, the appropriateness of the reference region, benchmarking these against our own independently observed forest loss and against our statistically matched dynamic baseline. Where a dynamic baseline is not available, we instead compare the project's asserted baseline against its own demonstrated effectiveness during the rated period, expressing any conclusion directionally rather than numerically given the greater uncertainty involved.

For APD projects, baseline-setting centres on the documented conversion plan, including its stated rate, extent, timing and post-conversion land use. We test these parameters against independent evidence of the agent's capacity and intent, against regional norms for comparable conversion activity, and, where the crediting methodology requires it, against the stability of post-conversion land use on comparable land converted by agents of the same type. A conversion plan whose economics do not hold up over time undermines the credibility of the baseline it underpins.

This risk driver differs between ex post and ex ante ratings. Ex post, the baseline can be tested against the project area's own subsequent history, including the divergence between the forecast baseline and observed forest change. Ex ante, the vintages under assessment have no such history to test against. Our assessment instead rests on the plausibility of the baseline's inputs and modelling approach at the point of forecast, corroborated where possible by historical trends in the reference region or, for APD, by observed outcomes on comparable land.

Several limitations apply and are disclosed where relevant. Constructing a robust dynamic baseline for AUD projects depends on the availability of suitable control areas to match against the project area. Where land governance context makes the dynamic baseline uninformative or requires heavy contextualisation, we rely on the weaker buffer-zone comparison described above.

Project scenario

Our objective is to determine whether the project has accurately monitored and reported forest loss and degradation within the project area over the rated vintage period. Undetected or unreported loss represents a discount on the emission reductions the project can credibly claim.

We compare the project's reported forest loss against our own independently observed forest change, drawn from our geospatial and Earth observation capabilities. Differences in monitoring methodology, minimum mapping units and forest definitions can account for a gap between the two figures on their own, without either figure being inaccurate, so we check for this before treating a gap as a sign of misreporting.

Forest degradation, as distinct from outright clearing, is frequently difficult to detect from satellite observation where canopy cover persists. Our assessment of degradation monitoring is therefore more qualitative, focusing on whether the project's chosen monitoring approach, for example field-based sampling as against self-reported or community survey methods, is fit for purpose given the type of degradation risk present.

The accuracy of forest-loss monitoring itself varies by biome and by data availability, and is generally lower in dryland ecosystems and regions with persistent cloud cover. Where this is the case, we frame our conclusions in terms of uncertainty rather than asserting a precise level of risk.

Project scenario accuracy applies mainly to ex post ratings, since it depends on an observed monitoring record to assess against the project's reporting. For ex ante ratings, where no such record

yet exists for the vintages under assessment, we instead assess the adequacy and credibility of the project's proposed monitoring approach and its projected forest-loss and degradation estimates, tested for consistency with the baseline assumptions and, where available, with observed outcomes on comparable land.

Disclosure of forest-loss and degradation monitoring in project documentation varies widely, and is often limited to headline figures rather than granular data. Where disclosure is poor, our assessment is correspondingly brief and high level, and we treat the resulting uncertainty as a limitation of the available evidence rather than a finding against the project.

GHG conversions

Our objective is to assess whether the project's selection of carbon pools and its estimates of carbon stocks are appropriate and unlikely to result in over-crediting.

We assess which carbon pools, including above- and below-ground biomass, soil organic carbon, deadwood, litter and harvested wood products, the project includes and excludes in both its baseline and project scenarios, and whether the resulting treatment is conservative. Above- and below-ground biomass are generally expected to be included in all cases. The materiality of other pools depends on ecosystem and geography, so we pay particular attention to soil organic carbon in ecosystems where it is likely to be a dominant pool, and to any indication that a project area may overlap unidentified peat soils.

Where soil organic carbon represents a material share of the project's carbon stock, particularly in peatlands, we apply additional scrutiny to the characterisation of this pool. We assess the project's estimates of peat extent and depth, bulk density, and carbon concentration, and whether the sampling design adequately captures spatial variation across the project area. We place greater weight on project-specific field measurements, such as peat cores and soil profiles, than on regional defaults, soil maps, or literature-derived values, and benchmark project assumptions against independent peat-specific datasets where available. We also assess whether measurements have been extrapolated appropriately across the project area and whether the depth of sampling captures the peat profile relevant to the project's carbon accounting. Risk is higher where material peat deposits are poorly characterised, where generic conversion factors are applied despite site-specific variability, or where assumptions about peat depth, bulk density, or carbon concentration could overestimate soil organic carbon stocks.

In projects containing peatland soils, we apply additional scrutiny to the characterisation of this pool. We assess the project's estimates of peat extent and depth, bulk density, and carbon concentration, and whether the sampling design adequately captures spatial variation in carbon stock across the project area. We also assess whether peatland GHG emissions, particularly CO_2 from peat oxidation and CH_4 under saturated conditions, are appropriately characterised using assumptions that reflect the project's peat type, land use, and hydrological conditions. We place greater weight on project-specific field measurements, such as peat cores and soil profiles, than on regional defaults, soil maps, or literature-derived values, and benchmark project assumptions against independent peat-specific datasets where available. We also assess whether measurements have been extrapolated appropriately across the project area and whether the depth of sampling captures the peat profile relevant to the project's carbon accounting. Risk is higher where material peat deposits are poorly characterised, where generic conversion factors are applied despite site-specific variability, or where assumptions about peat depth, bulk density, or carbon concentration could overestimate soil organic carbon stocks.

We benchmark the project's reported carbon stocks against independent comparators, including field-measured forest inventory data near the project area, relevant literature values, and remote-sensing-derived biomass estimates. We treat field-measured data as the stronger evidence base and literature-derived estimates as carrying greater uncertainty. We also assess the specificity

and appropriateness of the allometric equations or conversion factors applied, including their fit to the relevant species, vegetation type and geography.

GHG conversions risk is assessed consistently between ex post and ex ante ratings. It concerns the characterisation of carbon stocks and conversion factors rather than the monitoring of change over time, so the same benchmarking approach applies regardless of whether the vintages under assessment have already occurred.

Risk under this driver is lowest where reported carbon stocks are consistent with inventory and literature comparators and carbon pool treatment is appropriate or conservative, and highest where reported stocks exceed observed comparators and pools are non-conservatively excluded.

Leakage accounting

Activity displacement

Our objective is to determine whether deforestation activity that would otherwise have occurred within the project area has instead been displaced to areas outside it as a direct result of the project's implementation, and whether the project has appropriately accounted for this.

For AUD projects, we compare forest loss trends within the project's leakage belt, the area identified as most likely to receive displaced activity, against trends in a wider surrounding buffer, both before and after project implementation, to assess whether any increase is specific to the leakage belt or consistent with the broader regional trend. We assess the appropriateness of the leakage belt's delineation, drawing on the same evidence base used to assess the reference region under Baseline scenario where the methodology specifies one, and consider whether displacement beyond the leakage belt is plausible, for example through migration by displaced actors, and whether the project's accounting captures it. Where relevant information is available, we also consider the actual project-scenario behavior of any actors who were likely to be agents of counterfactual deforestation, to determine how their behavior has been modified by the project and whether they are shifting activities that drive forest loss elsewhere.

For APD projects, displacement is assessed differently, since the deforestation driver is a specific, identified agent rather than a diffuse threat tied to a particular location. We focus on other land held by the same baseline agent. A documented conversion agent is often identifiable and traceable across multiple landholdings, and we assess whether the project has appropriately accounted for the possibility that the agent shifts the same conversion activity onto that land.

For ex ante ratings, where no observed post-implementation record yet exists, we instead assess the credibility of anticipated displacement risk given the nature of the threat and the agent involved, rather than reconciling against observed outcomes.

For all projects, we assess leakage risk as the residual risk that remains from leakage after accounting for a project’s applied or intended leakage deduction.

Market leakage

Our objective is to assess whether the project's activities are likely to shift broader market supply and demand for a carbon-intensive commodity, for example timber, agricultural products or other extracted goods, in a way that induces additional emissions elsewhere through price effects, as distinct from the direct physical displacement of activity addressed under *Activity displacement*.

We assess whether the counterfactual activity the project avoids would have produced a tradeable, substitutable commodity, and if so, the scale of production involved, the geographic reach of the relevant market (local, regional or international), the availability of substitutes, and the sensitivity of supply and demand to price changes, drawing on trade statistics and literature on commodity

markets and their elasticity. Where the counterfactual activity is predominantly subsistence-oriented rather than market-oriented, market leakage risk is generally lower, though we remain alert to the possibility of a transition towards market-oriented activity over time.

We also assess how far any resulting shortfall in supply is likely to be met by bringing new land into production, as against being absorbed by land already in production, for example through intensification. Displacement onto new land carries greater market leakage risk, since it is more likely to result in additional deforestation elsewhere, whereas absorption by existing production has a smaller climate impact. We also consider whether the carbon density of land where displaced production is likely to occur differs materially from that of the project area, since this affects the climate impact of any given volume of displaced activity.

Market leakage risk is assessed similarly for ex post and ex ante ratings. It concerns the structural characteristics of the relevant commodity market rather than a project's monitored performance. As for activity shifting leakage, we assess risk as the residual risk that remains after accounting for a project's applied or intended leakage deduction.

Permanence

'The risk that the carbon avoided or removed by the project will not remain so for the time committed.'

Our analysis of this risk factor considers the permanence of climate benefit as it relates specifically to the contractual commitment of a given project and its credits. We distinguish the contractual commitment embodied in a carbon credit from the durability of carbon avoided or removed over 100 to 1,000 years or longer; the latter concept as applied in the carbon market is beset by inconsistencies and contradictions. To avoid confusion between contractual reality and theoretical debate, our assessment focuses on how long is actually committed to ensuring the carbon avoided or removed remains so, the mechanisms in place to guard against losses, and the strength and accuracy of the claims made.

Our assessment addresses four questions:

- How likely is it that the project's claimed carbon benefit will reverse before the end of its commitment period?
- This focus on claimed benefit is distinct from a generic assessment of whether the carbon stock is at risk. For example, hinterland landslides that drive loss in regions not treated as at-risk in the project's selected baseline do not constitute reversals of the claimed benefit.
- What is the severity of any carbon stock losses, and how does this compare to the project's credit issuance?
- How likely is it that carbon losses are transient - that is, recovered through future project activity such as regrowth or replanting?
- Is the project properly mitigating this risk through a risk buffer and/or other mechanisms, so as to limit the risk to its issued credits?

Identifying the commitment period

All identified risks to permanence are then considered in relation to the identified commitment period. Because we assess reversal risk over the period actually committed, the first step in any permanence analysis is to identify that period. Commitment periods are labelled differently by different standards bodies - as commitment period, project longevity, or minimum project term, among others. In some cases, the commitment period coincides with the crediting period. In some

cases, the commitment period is implicitly specified in the choice of 100-year global warming potentials for short-lived greenhouse gas species.

Assessing risk within the committed period allows for comparability between credits on the basis of what has actually been promised. For each permanence risk driver, we estimate the likelihood that a reversal occurs before the end of the commitment period, and the proportion of the project area, carbon stock, and/or carbon benefit expected to be affected. Together, these give an expected reversal, which we then translate into an impact on the project's carbon stocks per hectare and compare against the project's issuance. We then consider the effect of the risk buffer and of any other mitigation, such as replanting or committed future deductions, to arrive at a residual, unmitigated risk to the carbon stocks over the commitment period.

Framing the assessment as an expectation rather than a binary outcome matters, because the same expected reversal can be constructed in different ways: a high likelihood of a small reversal and a low likelihood of a total reversal may imply comparable expected losses, and both are captured. Individual risk drivers are assessed on this common basis, which allows risks of very different character - fire, drought, pests, encroachment, loss of rights - to be compared and aggregated coherently.

Table 6 sets out the risk drivers within our assessment of permanence.

Table 6. Sub-components of permanence assessed.

Risk factor	Risk driver category	Risk driver
Permanence	Natural risks	Fire
		Extreme weather
		Pests and diseases
		Sea level change
	Anthropogenic risks	Project management and carbon rights
		Encroachment risk
	Risk mitigation instruments	Risk buffer and mitigation
		Stakeholder engagement

Natural risks

Fire

Our objective is to determine the extent to which project carbon stocks are at risk from fire over the commitment period. If fires are likely to occur within the project area during that period and the tree species present are not generally fire-adapted, reversals are likely and permanence risk increases.

We establish the fire history of the project area and the surrounding landscape from Earth observation records of burned area and active fire detections, comparing periods before and after the project start date. Burned area captures the spatial extent of burning; active fire detections reflect the count of hot pixels at satellite overpass. Combining a historical perspective on fire activity within the project area with a broader view of fires across the landscape allows us to distinguish project-specific risk from regional background risk.

Where the project has reported a loss event within the rated vintage period, we assess whether its reported magnitude is consistent with our observations of burned area, and where there is notable inconsistency, we estimate the potential impact on claimed emissions reductions. Where we observe

significant fire activity within the project area since the project start but no loss event has been reported, and fire is otherwise unaccounted for, we estimate the emissions associated with those events and their effect on the project's claimed emissions reductions.

Interpretation is heavily context-dependent. Fire plays a natural role in many dryland and grassland ecosystems, and can be a fundamental ecological process in some forest systems, while causing tree mortality and long-term carbon loss in others. We therefore assess whether the project sits within a fire-adapted ecosystem and what proportion of the species composition within the project area is fire-tolerant. Fire activity across the wider landscape does not necessarily indicate high risk to the project. Conversely, where fire activity in the region is closely related to climate extremes or is increasing over time, this may indicate a rising risk of degradation, and we use climate projections and regional literature to form a view of fire risk over the remainder of the commitment period.

We also assess mitigation. This includes activities specifically directed at fire risk, such as fire breaks, fire marshals and patrols, and their likely effectiveness. It also includes the effect of the project's core AD activities themselves, which can cut both ways: avoiding clearcuts of uneven-aged stands containing large trees may inherently reduce fire risk, whereas deferring the thinning of dense young stands may increase it.

Extreme weather

This risk driver addresses drought and cyclones. Drought is assessed for all AD projects; cyclones are assessed where they are recorded within or near the project area.

Drought. We characterise drought history for the project area using the Standardised Precipitation Index (SPI) and the Standardised Precipitation Evapotranspiration Index (SPEI). Values are calibrated to the project's own location and to typical climatic conditions there, and are therefore not comparable across projects. We interpret the frequency, magnitude and trend of drought events, and consider whether decadal conditions are stable, deteriorating, or improving. A future drought analysis is then performed for the time period present-2100, based on CMIP6 climate models for four future scenarios: SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5. Analysis results include future projections of the SPEI drought index up to 2100, and derived future return periods of drought extremes.

The consequence of drought for carbon stocks depends on the forest. We therefore establish which species within the project area are drought-tolerant and their share of the composition, and form a view on whether projected conditions would push species beyond their tolerance to the point of materially increased mortality. We place these metrics in a wider context using academic and industry sources. Such context includes ecosystem type, topography, hydrological regime, regional land use, predominant species, and oceanic circulations such as El Niño.

Cyclones. Where cyclone tracks are recorded within the project's vicinity, we detail the events identified and the damage level implied by their intensity. Where tracks intersect the project area within the rated vintage period, we cross-reference our forest loss observations to establish whether loss resulted and whether it has been sufficiently accounted for. Forward-looking risk is assessed by reference to the probability of damaging events occurring near the project under the most likely climate scenario over the commitment period.

Pests and diseases

This risk driver is typically not material for Avoided Deforestation projects in naturally diverse, resilient forest ecosystems. We generally assess it only where there is specific evidence of an outbreak affecting, or likely to affect, the project area, or where project activities themselves introduce exposure, for example where an alternative-livelihood cash crop or high-value timber species relied upon to support project implementation is vulnerable to a known pest or disease.

Where relevant, we assess the presence and future risk of the pests and diseases in question and their likely impact on carbon stocks, drawing on national and regional forest health reporting and academic literature. This applies equally to AUD and APD projects.

Sea level change

This risk driver is typically not applicable for AD projects, outside those containing substantial areas of low-lying coastal forest. We assess it only where such exposure is present. Where applicable, we assess projected sea level change over the commitment period using published projections under more than one warming scenario, placed in local context using literature on topography, hydrology and sediment dynamics, and interrogate whether any risk assessment provided by the project adequately reflects this exposure.

Geological hazards

This risk driver is typically not applicable for AD projects. Where salient geological hazards - such as earthquakes, volcanic eruptions, landslides or tsunamis - are identified during analysis, they are assessed and reflected here.

Other natural risks

This risk driver is typically not applicable for AD projects. Where salient natural risks not captured by the drivers above (such as flooding unrelated to extreme weather) are identified during analysis, they are assessed and reflected here.

Anthropogenic risks

Project management and carbon rights

Carbon rights are property rights that enable the ownership and trading of accredited carbon units. Our assessment determines ownership of these rights and potential permanence risks. Details are found in project documents or literature.

Failure to secure land/carbon ownership, or reliance on traditional land rights, can pose permanence risks, as the project may occur on land to which it does not have legal title. This can result in legal conflict over the project, potentially leading to its discontinuation. Our analysis identifies the owners and users of the project land, including customary and overlapping claims, and verifies land titles, registry information, concessions, leases, easements and other evidence where it is available.

Where the developer does not own the land, we review the contractual transfer of land-use and carbon rights, the duration and renewal provisions, restrictions on withdrawal or transfer, remedies for breach and the relationship between the contract term and the commitment period. Free, prior and informed consent and equivalent consent principles are considered when communities or customary rights holders are affected. Claims are tested against national and subnational law and independent evidence on tenure security and land conflict. Clear land ownership by the project developer or local stakeholders reduces risks by decreasing the likelihood that projects will be discontinued due to legal conflicts.

Finally, we assess the technical capability of the proponent and landowner, including the number of forest carbon projects they have previously been involved in and whether there is precedent for them carrying out the specific activities the project requires.

Encroachment risk

Encroachment risk addresses unplanned human intrusion that may remove or degrade vegetation within the project boundary. We identify the principal regional drivers of land-use change and the communities, companies or other agents that could access the project area. Historical and current deforestation, mining, infrastructure and settlement pressure are reviewed using geospatial and third-party evidence.

Project-specific exposure is assessed from prior and planned land use, the value of project resources, road and river access, land availability elsewhere, nearby land-cover loss, protected-area effectiveness, tenure strength and whether local communities previously relied on the project land or access through it. Where use is restricted, we assess whether project benefits or alternatives replace the lost resources.

Our assessment uses a range of national and international datasets, including those pertaining to concessions for natural resource extraction, to assess the project's anthropogenic threat. For example, risk may be introduced if a high proportion of the project area overlaps with concessions. Risk is generally tempered if there is no evidence of concessions or other anthropogenic risks (such as conflict).

Here, we assess the risk to the project’s carbon stocks from changes in policy and protected status during the project's crediting period. For example, lands placed under permanent easements may be more likely to retain GHG benefits outside a project’s commitment period.

Risk mitigation instruments

Stakeholder engagement

Stakeholder engagement is assessed for cases where communities, landholders, or other affected parties can materially influence the continuation of project activities or the maintenance of carbon stocks. The analysis considers both the risk of withdrawal or non-compliance and the project's ability to deliver promised benefits.

We identify relevant stakeholders from project documentation and independent sources and assess whether free, prior and informed consent or equivalent informed agreement was obtained. We review the accessibility and independence of grievance and dispute-resolution mechanisms, the identification of affected groups, communication in appropriate languages and formats, reported disputes and the project's plans for resolution. Landholder contracts for AUD and APD projects are reviewed for withdrawal provisions, penalties and whether remedies could recoup the carbon impact of exit.

For benefit delivery, we compare promised mechanisms with project records, stakeholder reporting, relevant media and the performance of comparable projects. We consider administrative, legal and market barriers that may delay or prevent payments or non-financial benefits, and the measures used to bridge those failures. We likewise consider the anticipated schedule of benefit delivery with respect to the crediting and commitment periods. The conclusion reflects whether engagement and benefit delivery are likely to sustain participation for the commitment period.

We then determine how withdrawal or dissatisfaction could affect land management and carbon stocks. The absence of effective engagement may cause risks to materialise, including local communities encroaching on project areas, damaging carbon stocks, or, ultimately, withdrawing from carbon projects. Replacement enrolment is not automatically treated as mitigation because replacement landholders may face the same reasons for withdrawal, and prior investment or credited carbon may already have been lost.

To evaluate this risk, we apply a bottom-up approach that evaluates the presence and success of stakeholder consultations, grievance channels, benefit-sharing structures, and alternative livelihood activities through project-specific case studies, academic literature and project documents. Risks can be countered through strong evidence of community support and integration with project activities.

Risk buffer and mitigation

Our objective is to determine whether the project's risk buffer contributions, or comparable mitigation measures, are sufficient to address the residual permanence risk identified through our analysis. Procedures for calculating buffer contributions vary across standards bodies, from a fixed contribution applied to all projects of a given type to a bespoke, project-specific risk assessment, and buffer rules are not always fully implemented in practice. Our assessment first establishes whether a project's buffer allocation has in fact been deposited and, where it has not, what accounts for the shortfall. We then compare the project's own permanence risk assessment and buffer contribution against the risks identified through our independent analysis, and consider the effectiveness of any mitigatory activities beyond the buffer itself, assessed within the individual risk drivers to which they relate.

In an ex post rating, this assessment draws on the project's actual buffer contribution history and, where losses have occurred beyond the rated vintage, on the observed adequacy of the buffer in covering them, as well as on a comparison of the outstanding buffer pool to anticipated future reversal risks. In an ex ante rating, no deposit or loss history yet exists. Our assessment instead considers whether the buffer contribution rate the project's methodology requires is commensurate with the permanence risk our analysis anticipates, based on planned rather than demonstrated mitigation.

Mitigatory activities beyond the buffer are also considered, and are assessed within the individual risk drivers to which they relate. Where a project faces no residual permanence risk once the mitigation embedded in individual risk drivers is accounted for, that is reflected here.

Appendix I: Sources as of October 2026

Geospatial data sources

Our Geospatial and Earth Observation team uses data from, but not limited to, the following:

Aboveground carbon in mangroves (Caltech / Simard et al. 2018), Aboveground carbon northern Africa (NASA / Tucker et al. 2023), Administrative districts (OpenStreetMap), Amazon indigenous territories (RAISG), American Indian, Alaska Native, and Native Hawaiian Areas (U.S. Census Bureau), BeZero Carbon Boundaries Database (curated in-house from registry data and other public sources), BeZero Carbon Plots Database (curated in-house from private collections, national inventories, international plot networks, academic studies, research partnerships, and other sources), Brazil indigenous lands (Terrabrasilis), Brazil mining concessions (Brazil National Departament of Mineral Production), Brazil protected areas (National Registry of Conservation Units - CNUC), Brazilian Cadastro Ambiental Rural (Brazilian government), Brazilian Sistema de Gestão Fundiária (Brazilian government), California timber harvesting plans (California Department of Forestry & Fire Protection), Cambodia mining concessions (Open Development Cambodia), Cameroon community forest (Ministère des Forêts et de la Faune), Cameroon Forest Management Units (Global Forest Watch), Cameroon mining permits (Cameroon Ministry of Mines and Technological Development), Cameroon production forests (Ministère des Forêts et de la Faune), Canada mining permits (various

open sources), Chloris Above-ground biomass stock (Chloris Geospatial), Colombia agricultural frontier (El Sistema de Información para la Planificación Rural Agropecuaria (SIPRA)), Colombia mining titles (Tierra Minada), Colombia national parks (Parques Nacionales Naturales de Colombia), Congo peat maps (University of Leeds), Consejo Comunitario Titulado (Datos Abiertos Agencia Nacional de Tierras Colombia), CORINE landcover (Copernicus), Cost maps for ARR (Busch et al. 2024), Crop Sequence Boundaries (USDA), Cropland extent and change (GLAD/UMD), Decadal Land Use and Land Cover Classifications across India (Roy et al. 2016), Democratic Republic of the Congo mining permits (DRC Cadastre Minier), Dynamic World (Brown et al (2022)), EBA Brazil aboveground carbon (INPE), Ecoregion map (Resolve), Ejido territories (Registro Agrario Nacional - Catastro Rural), ERA5 Land climate variables (ECMWF), ESA Biomass Climate Change Initiative (Santoro, M.; Cartus, O. (2026)), ESRI Sentinel-2 10m land use land change time-series (ESRI), EU Farm Structure Survey (European Commission), European Union Tropical Moist Forests (IFORCE), Florida conservation lands (FLMA) (Florida Natural Areas Inventory), Forest Extent and Height Change, 2000-2020 (GLAD/UMD), Forest/Non-Forest (JAXA), Forest Type Groups of the United States (USDA Forest Service - Forest Inventory and Analysis (FIA) Program & Geospatial Technology and Applications Center (GTAC)), Forest ownership in the conterminous United States circa 2022 (Harris et al. (2025)), Forest Planning Open Data (Hokkaido Forest Planning Division, Forestry Bureau), Forisk North American Mill Capacity Database (Forisk), Gabon mining permits (Gabon Ministry of Mines, Petroleum, and Hydrocarbons & WRI), GEDI L2B canopy cover (NASA/UMD), GEDI L4A Footprint aboveground carbon (NASA/UMD), GEDI L4B Gridded aboveground carbon (NASA/UMD), GEDI Level-2A vegetation height (NASA/UMD), Global Canopy Height (ETH Zürich), Global Distribution of Mangroves (UNEP-WCMC), Global Forest Change (GLAD/UMD), Global Human Settlement Layer (GHS-SMOD) (Schiavina M., Melchiorri M., Pesaresi M. (2023)), Global Mangrove Watch (JAXA), Global mining extent polygons (Maus et al. 2022), Global mining extent polygons (Tang & Werner 2023), Global naturally regenerating forests (UN FAO), Global peatlands (CIFOR, Wetlands International, Indonesian Ministry of Agriculture, Indonesian Ministry of Transmigration and Land Resources), Global planted forest (UN FAO), GlobBiomass above and below ground carbon (ESA), HURDAT2 hurricanes (NOAA), IBTrACS hurricanes (NOAA), Integrated Deforestation Alerts (Global Nature Watch), IPCC AR6 Sea level rise (NASA/IPCC), IUCN Red List of Threatened Species (IBAT), Key Biodiversity Areas (IBAT), Köppen-Geiger climate classification (Beck et al. (2023)), Landsat 5, 7, 8 and 9 L2 Surface Reflectance (NASA/USGS), Land cover (JAXA), Malaysia logging concessions (Global Forest Watch), MapBiomas Brazil land cover (MapBiomas Brazil), MapBiomas Colombia land cover (MapBiomas Colombia), MapBiomas Paraguay land cover (MapBiomas Paraguay), MapBiomas Peru land cover (MapBiomas Peru), Mapbox visual basemap (Mapbox), Maxar Imagery Surface Reflectance (Maxar Technologies), MCD12Q1 Land Cover Type (NASA), MCD64A1 Burned area (NASA/UMD), Mexico mining concessions (Secretaria de Economia), Mineral Resources Data System (USGS), Minnesota DNR Management Units (Minnesota Department of Natural Resources), MOD44B Vegetation Continuous Fields (NASA), MYD10A2 Snow cover (NASA), MYD13Q1 Vegetation Indices (NASA), National Cropland Data Layer (USDA), National Flood Hazard Layer (FEMA), Navigable water (OpenStreetMap), New York Protected Area Database (NYPAD) (New York Natural Heritage Program), New York state (DEC) lands (New York State Department of Environmental Conservation), NEX-GDDP-CMIP6 (NASA/NCCS), Northern Forest land ownership map (Northern Forest Center), Oil and gas concessions (various government sources), Peru cadastral and concessions (Digital Government Secretariat Peru), Peru mining concessions (Ingemmet), Peru native community boundaries (Peru Ministry of Culture), Planet Forest Carbon Diligence (Planet Labs), Planet Quarterly visual basemaps (Planet Labs), PlanetScope Imagery Surface Reflectance (Planet Labs), Population density (WorldPop), Primary designated management objectives of forest (UN FAO), Primary humid tropical forests (GLAD/UMD), PRODES Amazon deforestation (INPE), Regrid US land parcel data (Regrid), Republic of the Congo mining permits (Republic of the Congo Ministry of Mines and Geology), Roads (OpenStreetMap), Root-shoot ratios (Huang et al. 2021), SDPT plantations, planting year and planted species (WRI / Du et al. 2022), Sentinel-2 L2A Surface Reflectance (ESA Copernicus), SkySat Imagery Surface Reflectance (Planet Labs), Soil cation exchange capacity (ISRIC), Soil nitrogen (ISRIC), Soil organic carbon (ISRIC), Soil type classification (ISRIC), Soil water pH (ISRIC), Species Rarity-weighted Richness (IBAT), SRTM Digital Elevation Model (NASA), STAR Species Threat Abatement and Restoration Metric (IBAT), STORM Cyclone

historical baseline (Bloemendaal et al. (2020)), STORM Cyclone future projections (Bloemendaal et al. (2022)), US Forest Type Groups of the United States (U.S. Department of Agriculture - Forest Inventory and Analysis (FIA) Program & Remote Sensing Applications Center (RSAC)), US National Conservation Easement Database (U.S. Endowment for Forestry and Communities), US Native lands (U.S Department of the Interior Bureau of Land Management), US Protected Areas Database (United States Geological Service (USGS)), US stand age (2005) (United States Geological Service (USGS)), US state boundaries (United States Census Bureau), USA Census of Agriculture (USDA), VARDA Global FieldID (VARDA), VNP14IMGML Active fire detections (NASA/UMD), World Database on Protected Areas (IBAT), Worldclim climatology (SEI), Global Population Data (unconstrained 100m) (WorldPop).

Other third-party datasets

In addition to our geospatial sources, we also incorporate many other third-party or industry datasets and sources into our assessments of individual risk factors. These include but are not limited to:

National and regional government information on climate change, GHG emissions, forestry and food production, domestic and international trade, pricing and distribution statistics; national forestry inventories, protected areas and easements; national and regional natural risk maps; policy trackers for impact, legislation, governance and action; land registration and titling databases including regional cadasters, mining concessions and indigenous territories; NDC registry; carbon credit pricing databases; national and regional mill capacity databases.

Literature sources

Our curated database of literature sources spans all types of peer-reviewed literature and industry research, with hundreds of entries for every sector, region or risk factor.

The number of relevant literature-based sources specific to the ARR and Avoided Deforestation sub-sectors runs to over 2,100 as of January 2025. In Figure 25, we show how these sources are split by carbon risk factor.

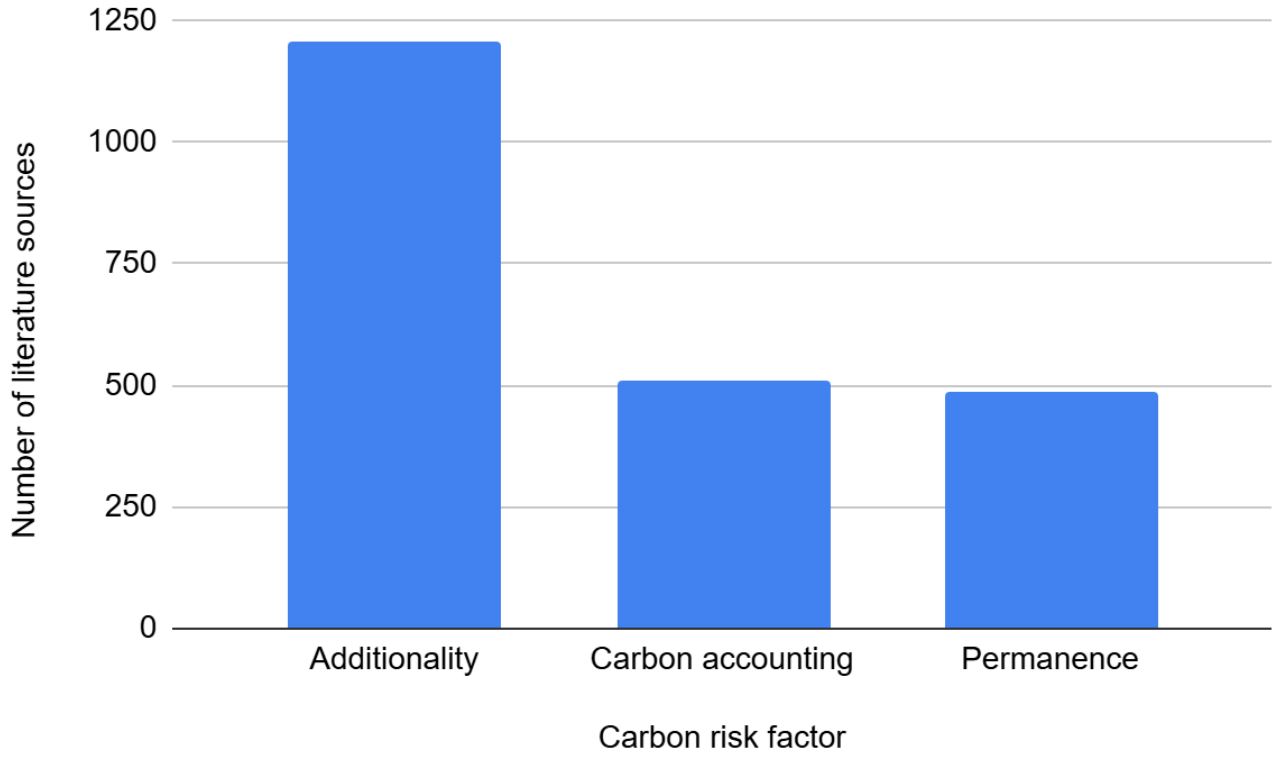


Figure X. Number of literature sources relevant to the ARR and Avoided Deforestation sub-sectors used by BeZero Carbon Ratings as of January 2025.

Appendix II: Additional reading

Check out the ratings resources page on our website to find links to all of our published methodologies, in addition to our series of risk factor assessment frameworks, our frameworks for assessing project methodologies and country-level risks, deep dives on factors influencing the carbon efficacy of projects in various sectors, and more.

Updates and reviews

Version number	Date	Description
1.00	21/12/23	Initial release
1.01	31/01/24	Formatting updates
1.02	03/10/24	Formatting updates and clarification on additionality as a limiting factor
2.0	25/03/25	Updated risk factor framework
3.0	27/10/26	Formatting updates, edits, and revisions to align with ESMA regulatory requirements

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