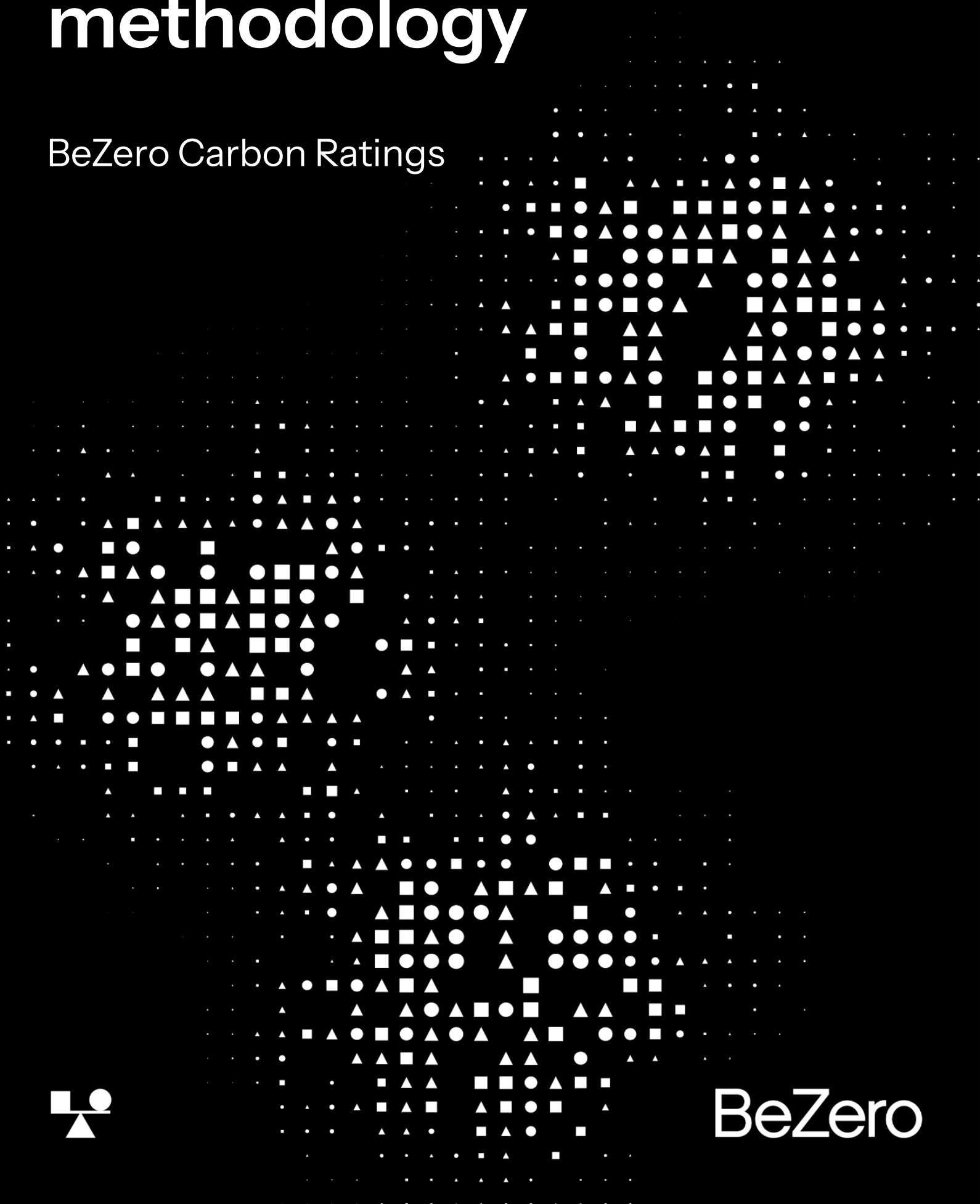
Ex ante methodology

BeZero Carbon Ratings



BeZero

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Introduction to the BeZero Carbon ex ante Rating

A carbon credit is a contract certifying a commitment that a tonne of CO_2e has been removed or avoided for a given period of time as a result of a given project activity.

This commitment typically relies upon third-party verification and validation, and ongoing monitoring, of a project's adherence to a given methodology for a given activity. Methodologies are designed and maintained by Standard Bodies, and in some instances have additional validation by industry initiatives such as the ongoing Integrity Council for the Voluntary Carbon Market. Some Standard Bodies also act as registries for the issued credits. This process, known as accreditation, is binary by design. It results in a standardised unit of account, i.e. a tonne of CO_2e avoided or removed, and credits are transacted and eventual climate claims made on that basis.

However, in our view, solely relying on a binary assessment to understand carbon efficacy or carbon credit quality is insufficient. Whether a whole tonne of CO_2e has been achieved cannot be verified with absolute accuracy. Assessing the quality of carbon projects involves counterfactual analysis, a mix of subjective and objective parameters that change over time, and retirements do not involve physical delivery for settlement. The heterogeneous nature of nature and engineered avoidance and removal projects also prohibits perfect fungibility. As do contrasting customer preferences and perceived value.

In order to confidently assess the CO_2e achieved, BeZero Carbon believes all carbon market participants (developers, investors, intermediaries, end buyers) need information and tools to understand the risks and uncertainties present. This is equally important across the various phases of project development, where the project has not issued any carbon credits, as it is for the parties interacting with credits that have been issued.

This document explains BeZero Carbon's approach to assessing carbon efficacy risk for ex ante carbon credits. This framework is applicable to any project type in any sector and leverages: a blend of qualitative and quantitative factors; financial, environmental, and policy assessment techniques; primary and secondary data sources.

BeZero Carbon Rating analytical framework

Ex ante rating definitions

A BeZero Carbon ex ante Rating (referred to as the 'ex ante rating') represents BeZero Carbon's opinion on the likelihood of the carbon credit achieving a tonne of CO_2e avoided or removed. It is an opinion on the greenhouse gas efficacy of an ex ante credit.

The BeZero Carbon ex ante Rating is:

- Assigned to **carbon credits which are not yet issued.**
- An opinion based on: a blend of qualitative and quantitative factors; financial, environmental, and policy assessment techniques; primary and secondary data sources - to the extent that they are relevant to assessing carbon efficacy risk.
- An assessment of the carbon efficacy of a project combined with the project execution risk. This provides a qualitative assessment of the risk that a project will fail to successfully reach operation.

The ex ante rating can be applied to credits at any stage of a carbon project's life cycle prior to a credit being issued. Once a credit is issued and available for retirement, it is no longer eligible for the ex ante rating but may be eligible for the BeZero Carbon Rating, (referred to as the 'ex post rating') upon fulfilling the requisite qualifying criteria '(please consult the BeZero Carbon Rating methodology (ex post) for details)'. BeZero Carbon will provide an ex-post rating for all such projects as soon as practicable.

The ex ante rating is expressed on the same eight-point scale as the ex post rating, with the addition of a lower case 'e' to distinguish it from the ex post rating.

Table 1. Ex ante rating definitions

Rating	Definition
BeZero Carbon Rating **AAAe**	A credit has the **highest likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **AAe**	A credit has a **very high likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **Ae**	A credit has a **high likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **BBBe**	A credit has a **moderate likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **BBe**	A credit has a **moderately low likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **Be**	A credit has a **low likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **Ce**	A credit has a **very low likelihood** of achieving 1 tonne of CO_2e avoidance or removal
BeZero Carbon Rating **De**	A credit has the **lowest likelihood** of achieving 1 tonne of CO_2e avoidance or removal

The ex ante rating is not an assessment of:

- The broader risks faced by a carbon project, e.g. fraud, negligence, default risk, political interference, business interruption, other than the extent to which such risks may inform our assessment of project execution risk.

- Any other element of the credit's quality other than how they relate to carbon efficacy, such as potential co-benefits from broader ecological and social impacts. These could include: biodiversity effects; social, health or economic impacts on local communities; or actual or potential SDG claims. To the extent such effects may compromise carbon efficacy they would be taken into consideration e.g. when considering stakeholder relations and the effect on non-permanence or project execution risk.

- The ex ante rating is not a measure of the likelihood that a forecast credit will be delivered or the risk that the number of credits actually issued by a project will vary from the number forecasted ex ante, also known as delivery risk. Delivery risk can occur as either an under or

over performance of issuance versus forecast, and can be driven by a number of factors. While the factors driving this are often related to the subsequent rating of the credits, this risk factor relates to quantity and does not feature directly in the rating. Please see here for more information on delivery risk.

Ex ante and ex post ratings

The ex ante rating is distinct from the ex post rating:

- An ex ante rating is assigned to **carbon credits which are not yet issued**. The ex post rating is applicable to carbon credits that **have been** issued.
- The ex ante rating is **valid as on the date the rating is issued; the ex post rating is valid at all times.**
- The ex ante rating is reviewed periodically (as a general rule annually) whereas the ex post rating is reviewed on an ongoing basis.
- An ex ante rating and an ex post rating can coexist for the same project but cannot coexist for the same vintage.
- Once a credit has been issued, an ex post rating can be assigned dependent on fulfilling the eligibility criteria.
- Ex ante ratings are published at the discretion of the customer and can either be kept private, shared with a list of recipients, or shared publicly. All ex post ratings and rating summaries for BeZero Carbon-rated projects are available on our website alongside the BeZero Carbon Rating methodology and explainer documents - www.bezerocarbon.com. The full rating analyses, including features and tools, for all ex post ratings are available to all subscribers via the BeZero Carbon Markets platform.
- The ex ante rating includes information that isn't publicly available, while the ex post rating does not.
- Note that a unanimous consensus at the BeZero Carbon Rating Committee is required for an ex ante rating to be assigned, similar to the process adopted for all ex post ratings.

Table 2. A summary of the differences between the ex ante and ex post BeZero Carbon Ratings.

	BeZero Carbon ex ante Rating	**BeZero Carbon ex post Rating**
Carbon credit scope	Pre-issuance (ex ante)	Post-issuance (ex post)
Design phase	✓	X
Implementation phase	✓	X
Operational phase: Pre-issuance	✓	X
Operational phase: Issued	X	✓
Valid when issued	✓	✓
Valid at all times	X	✓
Continuously monitored	X	✓
Reviewed annually	✓	X
Publicly available	At discretion of customer	✓
Privately available	✓	X
Full analysis	At discretion of customer	All BeZero Carbon Markets Platform users
Assignment criteria	Unanimous decision at the Rating Committee	Unanimous decision at the Rating Committee

BeZero Carbon ratings & the project life cycle

There are four phases in a typical carbon credit's lifecycle, as outlined in exhibit 1. An ex ante rating can be assigned at Phases 1 to 3, the ex post rating can be assigned at Phase 4.

Exhibit 1. Evolution of BeZero Carbon Ratings across a project's life cycle

Rating type	**Ex ante (provisional)**	**Ex ante**	**Ex ante**	**Ex post**
Phase	**Phase 1** Design	**Phase 2** Implementation	**Phase 3** Pre-issuance	**Phase 4** Issued
Example rating	AAAe*	AAAe	AAAe	AAA
Publication	Private only	Private/Public	Private/Public	Public only
Description	This is the design and conceptualisation phase. The parameters of how a project will be structured and implemented are yet to be fixed at this phase. Ratings assigned at this phase are marked as provisional by adding a '*' at the end of the headline letter rating. Ratings are provided on a bilateral basis to users as a private report with a limited distribution list to be agreed with the user.	The project has moved beyond the design phase, with the proposed parameters finalised. The ex ante rating can be applied to credits at this stage of the project lifecycle, with the rating applied to a vintage range. Once there is sufficient information available to show a project has moved to the implementation stage, the rating is no longer marked as provisional.	The project has been implemented and is operational. A project can now have both ex ante credits based on forecast operations, or issued ex post credits based on realised performance reported in monitoring reports. The ex ante rating is applicable only to ex ante credits at this stage and is vintage-based.	The verified credits have been issued for a given vintage and are available for retirement on a registry. The ex post rating is monitored on an ongoing basis and remains live as long as the project fulfils the qualifying criteria.

Introduction to the risk factor framework

Analytical framework

The ex ante rating is our opinion based on the balance of risks across five risk factors assessed across three steps.

This is broken down into: a) an assessment of the project's standalone carbon rating, which represents our opinion on the inherent carbon efficacy of credits expected to be issued by the project, and b) BeZero's assessment of project execution risk.

The standalone carbon rating is arrived at based on our analysis of additionality, carbon accounting and non-permanence risk. Project execution risk is then applied as a further discount factor to the standalone carbon rating, to arrive at the ex ante rating. This framework is summarised in the following table.

Table 3. Example summary table for ex ante assessment

Risk factor	**Assessment**
Additionality	a
Carbon accounting	bbb
Non-permanence	aa
Standalone carbon rating	**a (High likelihood)**
Project execution risk	High Risk
BeZero Carbon ex ante Rating	**Be (Low likelihood)**

Risk factor definitions

Additionality: The risk that a credit purchased and retired does not lead to a tonne of CO_2e avoided or removed that would not have otherwise happened.

Carbon accounting: The risk that the carbon accounting underlying a credit does not fully achieve a tonne of CO_2e avoided or removed.

Non-permanence: The risk that the carbon avoided or removed by a project will not remain so for the time committed.

Project execution risk: The risk that a project fails to go ahead prior to it being implemented. Applied as a discount factor.

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.

To make their assessment, BeZero Carbon analysts use a broad range of qualitative and quantitative inputs including, but not limited to, financial, environmental, and policy assessment techniques based on primary and secondary data sources.

Ex ante rating opinions, therefore, incorporate a comprehensive assessment of the fundamental drivers of risks associated with carbon efficacy at a project and vintage level, including, inter alia, natural, technological, economic, social, legal and regulatory factors. The rating will also incorporate any information risk, defined as the risk posed by the reliability or robustness of the information available. The assessment will consider the extent and implications of any information risks, and - where appropriate - will reflect that in the relevant risk factor.

Sector and country analysis

Top-down analysis focuses on the market sector of a proposed project, the country and/or region where it is based, and the methodology and standards applied. The bottom-up analysis focuses on interrogating the project's claims and the extent to which top-down risks are mitigated. Risks to carbon efficacy take account of all available evidence from top-down and bottom-up, and how these interact with each other.

Our assessments are based on all provided project documentation and information in combination with our in-house models, frameworks and databases. These include geospatial and Earth observation evidence and techniques where relevant, and a curated database from peer-reviewed literature, industry research and third-party datasets totalling more than 4000 sources as of July 2023.

Standards and methodology screening

The ex ante rating is not an assessment of potential compliance with standards body rules or the accreditation process. As an assessment of carbon efficacy, the methodology and standards followed form only one part of the overall review. Nevertheless, the strength, effectiveness, and scientific integrity of those methodologies and the rigour with which they have been implemented by each project form an integral part of our rating analysis. This reflects that it is not necessarily the methodology in isolation that drives credit quality, but how a project applies it (which can sometimes vary considerably).

Our analytical approach evaluates the rules of each standards body and each methodology on an individual basis. This screening includes an assessment of methodology development and consultation (for an overview of why this is important, see our Insight on VCM methodologies). Further to this, we consider all deviations from methodologies exhibited by projects. For example, this can include deviations in baseline assessments, minimum sampling requirements, minimum project parcel size, monitoring and verification requirements. Further, we consider the risks associated with projects that apply older or invalid methodologies, for example, due to outdated emission factors and global warming potentials.

Geospatial & Earth Observation

For NBS projects, data, analysis and insights from our Geospatial & Earth Observation (GEO) team form a core part of the analytical process. The team employs a number of techniques and draws on a diverse set of data inputs.

Data inputs are drawn from a range of sources including publicly available, via partnerships and from our in-house databases. These include:

- Spaceborne LiDAR, synthetic-aperture radar, and multispectral measurements from space agencies such as NASA and ESA. These provide medium to coarse resolution data with repeat global coverage. Such datasets support large-scale monitoring, and analysis over long historical time periods.

- We work with commercial providers to access multispectral measurements at high spatial resolutions. These data are used for tree crown segmentation, for monitoring of low canopy density, planting, and degradation.

- Commercial and in-country partnerships also provide access to national and global carbon maps, which we assess and apply as appropriate for the project context, as well as airborne LiDAR, which provides dense point clouds for structural canopy measurement, contributing to the calibration and validation of models for canopy height, cover and biomass.

- Through partnerships and collaborations globally, BeZero is accumulating a rich database of in situ measurements and ground data. The BeZero Carbon Plots Database is growing constantly, and numbers over 5,000 plots (as of July 2023). This inventory data is sourced from across the world and referenced against LiDAR, satellite, and market data. These data are key for understanding uncertainties in satellite-derived biomass estimates, project carbon stocks, and biodiversity

Analytical techniques employed by the team include some of the following

- Auditing project boundaries. The reliability of publicly available boundary data can be patchy. To overcome this, BeZero Carbon checks, corrects or reconstructs digital boundary data. This has been completed for hundreds of NBS projects to date.

- Visual and automated contextualisation of project area conditions and surrounding landscapes over time, using 2D and 3D maps.

- Using geospatial and Earth observation data to interrogate each component of emissions calculations, including carbon stock densities, baseline scenarios, assessment of forest cover (and other vegetation) change, and evidence of activity displacement (leakage).

- Carbon stock assessments combine our extensive ground data with satellite-derived carbon maps, sourced from space agencies, national research institutes, academic labs, and industry partners.

- Assessments of forest cover and change use a range of data including in-house machine learning models. We use local labels to train and validate canopy cover models to improve classification accuracy and reduce uncertainty. In grassland systems, we monitor vegetation changes using indices such as EVI and NDVI.

- For ex post baseline assessments, we use statistically-matched dynamic baselines. This involves the pairing of pixels using proprietary models, guided by machine learning and expert

review of local factors. These methods are adapted in the ex ante context to provide an assessment of deforestation drivers and the appropriateness of the project's reference region, compared to our matched controls.

- Additionality assessments are assisted through geospatial analysis of the extent to which project activities (e.g. tree planting) are common practice in the region.

- BeZero Carbon's fire detection tools leverage data from NASA, to help assess non-permanence risk at the project level. BeZero is contributing to the next-generation models for fire risk and committed emissions, working with ESA, academia, and other partners.

- BeZero Carbon's drought monitoring tools integrate climate reanalysis data from ECMWF with soils data from ISRIC. Our next iteration forecasts risk to 2050 using climate projections from the IPCC 6th Assessment Report. We also use climate projections to assess future risks to coastal projects from sea level rise, such as in the Mangroves sub-sector.

BeZero Carbon ratings reflect the balance of evidence across all types of information, both GEO and non-GEO. Subject to project-specific characteristics and evidence, GEO analysis may not be paramount in the final rating view if, for example, financial, policy or other analysis is deemed more decisive.

Assessing carbon risk factors

Sector methodologies

In the following sections, we outline the overall approach we take to assess carbon risk factors. This lays out the overarching analytical framework. We have detailed sector specific methodologies for each sector. For more detail on the specific analytical approach to different sectors please consult our Ratings resources page. These documents provide a more granular perspective on the analytical techniques employed to assess carbon risk factors within each sector.

Additionality

Our additionality assessment considers the risk that a credit does not achieve a tonne of CO_2e avoided or removed that would not have otherwise happened. Our assessment is independent of the accreditation process or requirements of standards bodies.

The ratings team undertakes its own research to assess additionality and how it relates to the quality of carbon credit projects. We will consider any evidence from the proposed or actual accreditation process that seeks to demonstrate additionality. This may include the appropriateness and results of any additionality tests applied. However, our assessment considers a much broader set of evidence and interrogates all aspects of additionality, regardless of how additionality is claimed under the rules of a standards body.

A holistic assessment of additionality

To assess additionality risk, we take a comprehensive approach that integrates various components of additionality including, but not limited to, common practice, carbon finance, regulatory and technology based barriers, and the plausibility of alternative scenarios. This holistic approach is in contrast to the approach used in the accreditation process, which may often be more narrow in focus.

For every rated project in every sub-sector of the VCM, we assess thirteen sub-components of additionality, and further components are considered for certain individual sub-sectors. At a more granular level, to take one sub-sector as an example, our analysis of additionality for Avoided Deforestation projects evaluates over 100 parameters related to project activities, legal backdrop, finances, and policy.

We take account of myriad drivers of additionality - and how they may change over a project's lifetime based on vintage splits - to go beyond the binary approach taken by standards bodies and deliver a probability-based risk assessment. This reflects the fact that whether a project is additional is ultimately an opinion - one that relies on a mix of objective and subjective analysis that changes through time.

Table 4. Sub-components of additionality assessed

Risk factor	Risk factor level 2	Risk factor level 3
Additionality	Additionality test	Appropriateness of applied additionality tests
	Project effectiveness	Effectiveness of project activity
	Activity analysis	Common practice analysis
		Identification of alternatives to the proposed project
		Barrier analysis
		First-of-its-kind analysis
	Financial analysis	Investment analysis
		Carbon finance - revenue analysis
		Income from sale of timber or non-timber forestry products
		Benefit-sharing
	Legal analysis	Land ownership
	Regulatory & policy backdrop	National climate and green investment landscape
		Nationally Determined Contribution
		Government interaction with the carbon market
		Coverage and effectiveness of protected areas
		Government effectiveness
		Regulatory surplus
	Policy	National classification
		Project management

The role of additionality tests

Standards bodies typically treat testing for additionality as a binary. Either the carbon reduced or removed by a project would have happened without the project going ahead, or it would not have. They also rely on a threshold analysis. Accreditation requires that a project has passed one or more tests set out by the methodology, rather than the extent to which the project passes the test(s).

This is a necessary part of the market mechanism. Additionality must be treated as binary to result in the issuance of whole units of carbon credits - otherwise they could never be traded or retired. You

cannot issue or trade error bands or probabilities. However, our analysis shows that additionality is variable regardless of which or how many additionality tests are applied.

The ratings team starts by interrogating the appropriateness of the additionality tests applied and identifying any limitations to the tools used to implement or evidence them by the developer. These may include the area used or the types of comparisons made when gauging common practice. Following this, the team seeks to corroborate the validity of the data underlying a project's additionality assessment using independent data sources, industry data, peer reviewed research and in-house expertise. Factors assessed include reported internal rates of return, penetration of technology or trends of investment and capital flow prior to project implementation, among others.

Our assessments of additionality take into account variables beyond the project boundaries and what the project self-reports. Inputs include the presence of global or national barriers to project delivery, the role of carbon finance in the overall revenue stream, and the effectiveness of policy instruments and governance for either pre-existing conservation or decarbonisation practices.

Table 6. Additionality risk factor scoring

Additionality **Appropriateness of additionality tests**	
aaa Lowest risk	The applied additionality tests conclusively demonstrate why the project would not have otherwise been implemented and how it is enabled through carbon finance using inputs and claims that are appropriate, accurate and verifiable.
aa Very low risk	The applied additionality tests convincingly demonstrate why the project would not have otherwise been implemented and how it is enabled through carbon finance. In addition, almost all key inputs and claims are seemingly appropriate, accurate and verifiable.
a Low risk	The applied additionality tests credibly demonstrate why the project would not have otherwise been implemented and how it is enabled through carbon finance. In addition, most key inputs and claims are seemingly appropriate, accurate and verifiable.
bbb Moderate risk	The applied additionality tests plausibly demonstrate why the project is unlikely to have otherwise been implemented and how it is enabled through carbon finance. In addition, most key inputs and claims that are seemingly appropriate, accurate and verifiable.
bb Moderately high risk	The applied additionality tests potentially demonstrate why the project is unlikely to have otherwise been implemented and how it is enabled through carbon finance. That said, some key inputs and claims are seemingly non-conservative, potentially inaccurate or not verifiable.

b High risk	The applied additionality tests do not plausibly demonstrate why the project is unlikely to have otherwise been implemented and how it is enabled through carbon finance. In addition, some key inputs and claims are seemingly non-conservative, potentially inaccurate or not verifiable.
c Very high risk	The applied additionality tests do not plausibly demonstrate why the project would not have otherwise been implemented nor how it is enabled through carbon finance. In addition, many key inputs and claims are seemingly non-conservative, potentially inaccurate and not verifiable.
d Highest risk	The applied additionality tests do not demonstrate why the project would not have otherwise been implemented nor how it is enabled through carbon finance. In addition, utilised inputs and claims are materially non-conservative, potentially inaccurate and not verifiable.

Activity analysis

aaa Lowest risk	The project activity is either the first of its kind, very uncommon or has several significant barriers to implementation. There is an extremely high likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
aa Very low risk	The project activity is uncommon or has high barriers to implementation. There is a very high likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
a Low risk	Few instances of the project activity exist globally or within the country, or the project has some barriers to implementation. There is a high likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
bbb Moderate risk	Some instances of the project activity exist globally and within the country or the project has some barriers to implementation. There is a moderate likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
bb Moderately high risk	Some instances of the project activity exist globally, within the country and locally, or the project has some barriers to implementation. There is a moderately low likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.

b High risk	Many instances of the project activity exist globally, within the country and the region, or the project has few barriers to implementation. There is a low likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
c Very high risk	The project activity is common or has few barriers to implementation. There is a very low likelihood that in the absence of the project activity the CO_2e avoided or removed would not occur.
d Highest risk	The project activity is very common or has no barriers to implementation. The project activity would have very likely occurred even in the absence of the project activity and the CO_2e would have been avoided or removed.

Financial analysis

aaa Lowest risk	Revenue from carbon credits accounts for almost all income for the project, without which the project would have very little likelihood of being viable.
aa Very low risk	Revenue from carbon credits accounts for a significant majority of income for the project, without which the project would have little likelihood of being viable.
a Low risk	Revenue from carbon credits accounts for a majority of income for the project or plays a significant role in making the project viable.
bbb Moderate risk	Revenue from carbon credits accounts for a material proportion of income for the project or plays a meaningful role in making the project viable.
bb Moderately high risk	Revenue from carbon credits accounts for a moderate proportion of income for the project or plays a partial role in making the project viable.
b High risk	Revenue from carbon credits accounts for a small proportion of the income for the project; the project is likely to be viable even without these revenues.
c Very high risk	Revenue from carbon credits accounts for a very small proportion of the income for the project; the project is highly likely to be viable even without these revenues.
d Highest risk	Revenue from carbon credits accounts for a negligible proportion of the income for the project; the project is viable without carbon finance.

Policy analysis

aaa Lowest risk	There is no policy support available for the project activity, or there is some policy support but it is highly ineffective, or there are no regulations mandating and/or supporting the project activity.
aa Very low risk	There is very little policy support available for the project activity, or there is little policy support but it is ineffective, or there are very few effective regulations mandating and/or supporting the project activity.
a Low risk	There is little policy support available for the project activity, or there is some policy support but it is mostly ineffective, or there are few effective regulations mandating and/or supporting the project activity.
bbb Moderate risk	There is some policy support available for the project activity with partial effectiveness or there are some regulations mandating and/or supporting the project activity with partial effectiveness.
bb Moderately high risk	There are several policies supporting the project activity with reasonable effectiveness or there are some regulations mandating and/or supporting the project activity with reasonable effectiveness.
b High risk	There is strong policy support available for the project activity in an effective policy environment or there are effective regulations mandating and/or supporting the project activities.
c Very high risk	There is very strong policy support available for the project activity in an effective policy environment or there are very effective regulations mandating and/or supporting the project activities.
d Highest risk	There is highly effective policy support available for the project activity and effective regulations clearly mandating and/or supporting the project activities.

Legal analysis

aaa Lowest risk	The project faces negligible risk from the legal and ownership status of the project area and activity; the project area had no prior effective protections.
aa Very low risk	The project faces very little risk from the legal and ownership status of the project area and activity; the project area had no prior effective protections.

a Low risk	The project faces low risk from the legal and ownership status of the project area and activity; the project area had no prior effective protections.
bbb Moderate risk	The project faces some risk from the legal and ownership status of the project area and activity, or from effective protections that are independent of carbon finance.
bb Moderately high risk	The project faces moderate risk from the legal and ownership status of the project area and activity, or from effective protections that are independent of carbon finance.
b High risk	The project faces notable risk from the legal and ownership status of the project area and activity, or from effective protections that are independent of carbon finance.
c Very high risk	The legal and ownership status of the project area or activity is subject to uncertainty, or prior effective protections significantly undermine the additionality of the project.
d Highest risk	The legal status of the project area or activity is disputed, or prior effective protections extensively undermine the additionality of the project.

Project effectiveness

aaa Lowest risk	The project faces negligible risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits being delivered as expected.
aa Very low risk	The project faces very little risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits being delivered close to as expected.
a Low risk	The project faces low risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits broadly being delivered as expected.
bbb Moderate risk	The project faces some risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits largely being delivered as expected.
bb Moderately high risk	The project faces moderate risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits only being partially delivered as expected.

b High risk	The project faces notable risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits being delivered to some extent as expected.
c Very high risk	The project faces a very strong risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits largely not being delivered as expected.
d Highest risk	The project faces significant risk of ineffectiveness, which is characterised by project activities and associated greenhouse gas and monetary benefits not being delivered as expected.

Carbon accounting

Our carbon accounting assessment considers the risk that the carbon accounting underlying a credit does not achieve a tonne of CO_2e avoided or removed. Our analysis assesses the core building blocks of a carbon project's proposed credit issuance, interrogating how appropriate the calculations and assumptions are. This review includes an assessment of both over-crediting and leakage risks:

- Over-crediting: the risk that more credits are issued than tonnes of CO_2e achieved (or proposed to be achieved) by a given project due to factors such as unrealistic baseline assumptions or employing data with large uncertainties.

- Leakage: the risk that the carbon avoided or removed by a project is pushed beyond its boundaries, thereby undermining the degree of carbon efficacy. The two sources of leakage are market leakage and activity displacement.

Our assessment of carbon accounting is driven by the accuracy and appropriateness of each of the four components of credit calculation: baseline carbon stocks, project carbon stocks, leakage emissions and non-permanence deductions.

The relative contribution of each of the four components toward credit calculations depends on the project type and context. For many projects in the Voluntary Carbon Market (VCM) which conduct avoidance activities (responsible for almost 90% of currently outstanding credits), the baseline assumptions are the primary driver. Within these project types, technology-based interventions often assume zero project and leakage emissions, and risk buffers are not placed into a global pool.

Meanwhile, credit issuance for NBS projects relies on all four components, given the risk of non-permanence and leakage typically associated with them. For removals projects, accurate project carbon stock estimates are crucial for ensuring that the correct number of credits is issued.

Such variability in the composition of credit calculations requires bespoke assessments of over-crediting, which take into account both top-down sectoral and national trends, and bottom-up project specifics.

Credit issuance calculations: parameters

In addition to the varying composition of credit calculations, assessing over-crediting risks requires different information for different sectors. This is because the data underlying baseline calculations vary between project types. For all projects, key parameters broadly include the robustness of baseline assumptions and reported greenhouse gas flows.

In certain sub-sectors such as Renewables, emissions reduction calculations are estimated by simply deducting project emissions from baseline emissions. Since baseline emissions are in part determined by the grid emission factor, whether a project employs static or dynamic emission factors is an important consideration for such initiatives.

For every rated project in every sub-sector of the VCM, we assess at least six sub-components of carbon accounting, and further components are considered for certain individual sub-sectors. These include analysis of the components, drivers and assumptions that underpin the baseline used, the reported greenhouse gas flows, and drivers of leakage.

At a more granular level, to take one sub-sector as an example, our analysis of carbon accounting for Avoided Deforestation projects evaluates multiple parameters related to the baseline including the drivers and agents of land use change, resource use, the reference region and historical reference period employed, and the baseline model used.

Table 7. Sub-components of carbon accounting assessed for Avoided Deforestation

Risk factor	Risk factor level 2	Risk factor level 3
Over-crediting	Baseline	Drivers and agents of land use change and resource use
		Reference region
		Historical reference period
		Model selection
	Reported greenhouse gas flows	Carbon pools
		Carbon measurement
		Emission monitoring
Leakage	Leakage	Activity displacement
		Market leakage
		Ecological leakage
		Acquisition of materials / infrastructure

Leakage

Leakage is the risk that emissions avoided or removed by a project are pushed outside the project boundary. The sources of such emissions vary from sector to sector, however, they can be broadly categorised into market leakage and activity displacement.

Market leakage occurs when a project's activities alter the supply and demand equilibrium, shifting market dynamics such that emissions avoided or removed by a project are offset by market activities elsewhere. Meanwhile, activity displacement refers to a specific emitting activity being displaced more locally.

Both market leakage and activity displacement are unintended consequences which can undermine the carbon benefits of a project. It is vital that project developers anticipate, monitor and mitigate risks

to ensure that each credit delivers a full tonne of CO_2e avoided or removed.

Key factors when assessing leakage risk

To break down our assessment of leakage risk, we assess the two components of leakage (activity shifting and market effects) and leakage mitigatory safeguards employed by projects.

- Components of leakage

Projects can be exposed to both market leakage and activity displacement. Our consideration of market leakage includes upstream emissions, lifecycle emissions and product supply and demand dynamics. Meanwhile, our consideration of activity displacement includes specific analyses on the drivers and agents of project activities, carbon stocks of areas where activities may be moved to, baseline conservativeness and models applied, etc. We also note that this form of leakage is typically most relevant to NBS projects.

In certain cases, ecological leakage can occur, such as when a project's activities lead to a growth in carbon stocks beyond its boundaries. An example of this is when the management of sustainable woodlots leads to continued growth of carbon stocks outside of a project, acting to mitigate negative leakage.

There is variation in how projects account for leakage, if at all. If risks are deemed to be negligible, leakage emissions are often assumed to be zero.

In line with our ex ante rating framework, we consider risks arising from both a top-down and bottom-up perspective. For the former, this involves consideration of global and national data on parameters such as product supply and demand. The latter pertains to the interrogation of project-specific information on factors such as historic land-use in the area.

This hybrid approach ensures that as broad a range of sources of potential leakage risk as possible are considered and accounted for in the rating.

- Safeguards

Once potential leakage sources are identified, we interrogate any safeguards employed (or proposed to be employed) by the project.

Possible safeguards include measurement of emissions in leakage belts, the creation of leakage management areas and mitigatory activities (e.g. development of alternative livelihoods), and the application of leakage discount factors, among others. For each of these safeguards, our analysis considers their appropriateness and conservativeness and finally, actual application.

When assessing the suitability of the discount factor used, a range of techniques may be employed. This could include comparing the employed value to other estimates of leakage rates in a project's region, whether derived from our own in-house estimates or those from top-down evidence and peer-reviewed literature.

Table 8. Carbon Accounting risk factor scoring

Carbon accounting	
Baseline	
aaa Lowest risk	The project's baseline emissions (carbon stocks) have a negligible risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are conservative and realistic.
aa Very low risk	The project's baseline emissions (carbon stocks) have a very low risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are mostly conservative and realistic.
a Low risk	The project's baseline emissions (carbon stocks) have a low risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are broadly conservative and realistic.
bbb Moderate risk	The project's baseline emissions (carbon stocks) have a moderate risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are only somewhat conservative and realistic.
bb Moderately high risk	The project's baseline emissions (carbon stocks) have a moderately low risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are likely to be somewhat non-conservative or unrealistic.
b High risk	The project's baseline emissions (carbon stocks) have a high risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are broadly non-conservative or unrealistic.
c Very high risk	The project's baseline emissions (carbon stocks) have a very high risk of leading to over-crediting, given the use of modelled data, techniques, and assumptions that are mostly non-conservative or unrealistic.
d Highest risk	The project's baseline emissions (carbon stocks) have a significant risk of leading to substantial over-crediting, given the use of modelled data, techniques, and assumptions that are neither conservative nor realistic.
Project greenhouse gas (GHG) flows	
aaa Lowest risk	The project's reported GHG flows pose a negligible risk of leading to over-crediting, reflecting monitoring and assumptions that are accurate, comprehensive, and conservative.
aa Very low risk	The project's reported GHG flows pose a very low risk of leading to over-crediting, reflecting monitoring and assumptions that are mostly accurate, comprehensive, and conservative.

a Low risk	The project's reported GHG flows pose a low risk of leading to over-crediting, reflecting monitoring and assumptions that are broadly accurate, comprehensive, and conservative.
bbb Moderate risk	The project's reported GHG flows pose a moderately low risk of leading to over-crediting, reflecting monitoring and assumptions that are generally accurate, comprehensive, and conservative.
bb Moderately high risk	The project's reported GHG flows pose a moderate risk of leading to over-crediting, reflecting monitoring and assumptions that are likely not fully accurate, comprehensive, or conservative.
b High risk	The project's reported GHG flows pose a high risk of leading to over-crediting, reflecting monitoring and assumptions that are not accurate, comprehensive, or conservative.
c Very high risk	The project's reported GHG flows pose a very high risk of leading to over-crediting, reflecting monitoring and assumptions that are not accurate, comprehensive, or conservative.
d Highest risk	The project's reported GHG flows pose a significant risk of leading to substantial over-crediting, reflecting monitoring and assumptions that are not accurate, comprehensive, or conservative.

Leakage

aaa Lowest risk	The project faces negligible risk of unaccounted-for removed or avoided emissions leaking outside of the project's boundaries on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.
aa Very low risk	The project faces marginal risk of unaccounted-for removed or avoided emissions leaking outside of the project's boundaries on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.
a Low risk	The project faces low risk of unaccounted-for removed or avoided emissions leaking outside of the project's boundaries on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.
bbb Moderate risk	The project faces moderate risk of unaccounted-for removed or avoided emissions leaking outside of the project's boundaries, on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.
bb Moderately high risk	The project is liable to result in some unaccounted-for leakage beyond the project's boundaries on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.
b High risk	The project is liable to result in notable unaccounted-for leakage beyond the project's boundaries, on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.

c Very high risk	The project is liable to result in significant unaccounted-for leakage beyond the project's boundaries, on account of market leakage, activity displacement ecological leakage, and leakage adjustments.
d Highest risk	The project is liable to result in acute unaccounted-for leakage beyond the project's boundaries, on account of market leakage, activity displacement, ecological leakage, and leakage adjustments.

Non-permanence

Our rating assessment considers the risk that the carbon avoided or removed by a project will not remain so for the time committed. This includes credit issuance adjustments for non-permanence such as allocations to a risk buffer pool.

Our analysis of this risk factor considers the permanence of the contractual commitment of a given project and its proposed credits. A full assessment of these risks requires an understanding of: a) how long is actually committed to ensuring the carbon avoided or removed remains so, b) the mechanisms in place to guard against any losses, and c) the strength and accuracy of the claims made.

Key factors when assessing risk of non-permanence

To break down our assessment of non-permanence, we lay out the primary considerations and how they vary across different sectors and registries: commitment periods, risks, and employed safeguards.

- Commitment periods

In order to make an assessment of a credit's non-permanence risks, it is first necessary to determine the time period a credit commits to, and then whether the credit faces reversal risks. Commitment periods are the duration over which sequestration or abatement activities have permanence horizons, and differ from crediting periods (the timeframes during which reductions or removals are eligible for issuance as verified carbon credits).

For example, projects registered on Verra's Verified Carbon Standard (VCS) which fall under NBS are required to assess risks at a permanence horizon of up to 100 years. However, across standards bodies there is a lack of standardised terminology relating to how measurement, reporting and verification (MRV) is conducted over multi-decadal timescales, as highlighted in Table 9.

We focus on NBS projects here because for non-NBS initiatives, standards bodies do not provide permanence horizons, given that those activities face no technical risk of reversal. Gold Standard (GS) is omitted as they have no publicly-defined commitment period for NBS projects. This supports our approach to non-permanence of addressing risk level within commitment periods to allow comparability, rather than viewing non-permanence in absolute terms.

Table 9. Commitment periods for ARR projects, illustrating the variability within and between standards bodies.

Standards body	Minimum and maximum commitment periods (years)
American Carbon Registry	40 - undefined
Climate Action Reserve	undefined - 100
Plan Vivo	50 - undefined
Verra	20 - 100

- Risks and safeguards: sectoral variation

We assess natural risks, anthropogenic (including legal) risks and mitigation as the three major components of non-permanence risk. At least four sub-components are assessed for all projects and further components are considered for certain individual sub-sectors.

At a more granular level, to take one sub-sector as an example, our analysis of non-permanence for Avoided Deforestation projects evaluates at least nine sub-categories of risks.

Table 10. Sub-components of non-permanence assessed for Avoided Deforestation

Risk factor	Risk factor level 2	Risk factor level 3
Non-permanence	Natural risks	Fire risk
		Extreme weather
		Pest and disease
		Sea level rise
	Anthropogenic and legal risks	Anthropogenic risks
		Land ownership
		Carbon rights
		Protection status and effectiveness
	Risk mitigation	Risk buffer and mitigatory activities
		Stakeholder engagement

- NBS buffer pool requirements

Procedures for assessing and mitigating non-permanence risks also vary across the main market accreditors. GS requires all NBS projects to make a fixed contribution of 20% towards a pooled risk buffer. VCS, on the other hand, requires that such projects undertake an independent and bespoke risk assessment to determine the proportion of credits which must be transferred to a global buffer pool.

The use of a buffer pool can mitigate against unforeseen losses in carbon stocks. We consider projects registered under VCS to follow best practice, given the requirements that both internal risks (e.g. project management) and external risks (e.g. natural hazards) are quantified and accounted for. Projects registered under Climate Action Reserve also require an independent risk assessment, however this involves many 'default' risk factors which can lead to project-specific details not being considered. Meanwhile, the American Carbon Registry has a buffer pool, yet also permits the use of a variety of insurance mechanisms. These can include bonds and letters of credit, and are designed to act as proof that a project developer could cover the costs of sufficient credits to offset a reversal event.

For NBS projects, understanding how and why buffer pool contributions are made is vital for making non-permanence assessments, especially since there is strong evidence that risk buffer rules are not always fully implemented.

Table 11. Non-permanence risk factor scoring

Non-permanence

Natural risk	
aaa Lowest risk	The project faces negligible natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
aa Very low risk	The project faces minimal natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
a Low risk	The project faces low natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
bbb Moderate risk	The project faces moderately low natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.

bb Moderately high risk	The project faces moderate natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
b High risk	The project faces high natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
c Very high risk	The project faces very high natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.
d Highest risk	The project faces extreme natural risks which could result in a reversal of carbon stocks. This is based on the likelihood and significance of natural risk events such as fire, drought, or disease over the course of the credit's commitment period.

Anthropogenic risk

aaa Lowest risk	The project faces negligible anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.
aa Very low risk	The project faces minimal anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.
a Low risk	The project faces low anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.
bbb Moderate risk	The project faces moderately low anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.
bb Moderately high risk	The project faces moderate anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.

b High risk	The project faces high anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area and harvesting over the course of the credit's commitment period.
c Very high risk	The project faces very high anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.
d Highest risk	The project faces extreme anthropogenic risk which could result in a reversal of carbon stocks. This is based on the likelihood of encroachment into the project area leading to removal or loss of carbon stocks over the course of the credit's commitment period.

Legal risks

aaa Lowest risk	The project faces no legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or carbon rights being contested over the course of the credit's commitment period.
aa Very low risk	The project faces minimal legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or carbon rights being contested over the course of the credit's commitment period.
a Low risk	The project faces low legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or carbon rights being contested over the course of the credit's commitment period.
bbb Moderate risk	The project faces moderately low legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or carbon rights being contested over the course of the credit's commitment period.
bb Moderately high risk	The project faces moderate legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or the carbon rights being contested over the course of the credit's commitment period.
b High risk	The project faces high legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or the carbon rights being contested over the course of the credit's commitment period.
c Very high risk	The project faces very high legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or the carbon rights being contested over the course of the credit's commitment period.

d Highest risk	The project faces extreme legal risk which could result in a reversal of carbon stocks. This is based on the likelihood of land ownership or the carbon rights being contested over the course of the credit's commitment period.

Risk mitigation

aaa Lowest risk	The project has adequately captured the full severity of above risks in its non-permanence buffer pool contributions and/or fully mitigated all non-permanence risks through the use of mitigatory activities.
aa Very low risk	The project has adequately captured the severity of above risks in its non-permanence buffer pool contributions and/or mitigated the majority non-permanence risks through the use of mitigatory activities.
a Low risk	The project has largely captured the severity of above risks in its non-permanece buffer pool contributions and/or mitigated most non-permanence risks through the use of mitigatory activities.
bbb Moderate risk	The project has adequately captured some of the severity of above risks in its non-permanece buffer pool contributions and/or mitigated some non-permanence risks through the use of mitigatory activities.
bb Moderately high risk	The project has captured some of the severity of above risks in its non-permanence buffer pool contributions and/or some non-permanence risk mitigation activities in place with mixed effectiveness.
b High risk	The project has partially captured the severity of above risks in its non-permanence buffer pool contributions and/or some non-permanence risk mitigation activities in place with low effectiveness.
c Very high risk	The project has insufficiently captured the severity of above risks in its non-permanence buffer pool contributions and/or minimal non-permanence risk mitigation activities in place which lack effectiveness.
d Highest risk	The project has not captured the severity of above risks in its non-permanence buffer pool contributions and/or no non-permanence risk mitigation activities in place.

Assessing project execution risk

Project execution risk refers to the risk that a project fails to be fully implemented and reach operational stabilisation. This risk is inherent in all projects, irrespective of how well they are designed and how experienced the project proponent/project implementation team is.

Typically, project execution risks comprise of:

- Technical/technological risk
- Financial risk
- Legal and regulatory risks
- Operational risk
- Project proponent past experience

Technical/technological risks

Technical/technological risk refers to the risk that the project's chosen technology, design, configuration may not work as planned. These could be technical (an untested DAC technology), design (choosing a wind farm location without adequate analysis of historical wind data) or configuration (an afforestation project in land historically occupied by tribes, without due consultation with them) etc. This risk is also referred to as 'technical feasibility' risk, though the term 'technical' is loosely defined in the context of voluntary carbon projects.

Our technical/technology risk assessment involves understanding:

- How proven/untested is the project's chosen technology?
- How simple/complex is the project's configuration - are there multiple moving parts/stakeholders involved or very few moving parts/stakeholders involved? Is this the first of its kind project or there are several examples of such projects being implemented locally, regionally, or globally
- Has the project conducted a detailed technical feasibility study?
- What were the challenges faced by such projects when (if) previously implemented? How were they overcome? Has the project planning/design adequately factored in the learning from this and made suitable adjustments to the project design/implementation?
- Does the project require specialist knowledge or expertise, and if so, how has the project assembled the required expertise? If not, how is the project planning to acquire this expertise?
- Has the project tied up all aspects of the project implementation including identification/contracts with subcontractors, vendors, specialists, etc.?
- Has the project procured rights to use the land/space required for the project?
- Has the project assessed risks of floods/fire/natural disasters relevant to the project area? How is it proposing to mitigate these risks?
- Has the project consulted and onboarded all stakeholders whose cooperation is critical for the project's success?
- How long is the project implementation period? Does it have multiple phases or a single phase? What are the interim milestones and the processes proposed to monitor and report on progress?
- Has the project defined when/what would determine that the project has 'completed' implementation and moved into the 'operations' phase?
- How easy / difficult is it to replace any of the project implementation partners/suppliers/personnel involved in the implementation of the project? What is the associated cost/impact of such replacement? How does such replacement affect the project feasibility/implementation?

Financial risk

Financial risk refers to the risk that a project may not be implemented or operate as planned if it has not secured adequate funding.

Our financial risk assessment involves understanding:

- Has the project conducted a financial feasibility study to determine cash flows, IRR, etc.?
- Has the project made an assessment of the total funding required during the project implementation phase and the operational phase?
- What are the sources of funds and are there binding contracts/agreements to support availability of these funds?
- Are any of the funding sources linked to market risk/uncertainty (e.g. price of carbon credit, milestones linked, variable interest rate). If yes, how has the project planned for variations in the cost/quantum of funds available to the project?
- Is there a funding gap and if so, what are the plans to bridge this gap?
- Does the project proponent have prior experience in raising funds from the proposed sources? Do they have existing relationships with the financiers?
- Has the project entered into firm offtake agreements for its output/services/carbon credits, as applicable?
- How easy/difficult is it to replace these offtake partners in the event they back out?
- What is the nature and quantum of insurance covers the project is proposing to take?

Legal and regulatory risks

Legal and regulatory risks encompass risks to the project from current and evolving regulations, government policies, permissions/licences required, rights over the project land, etc.

Our assessment of legal and regulatory risks involve and understanding of:

- Does the project have legal ownership/lease over the project land granting it irrevocable right to implement the project?
- Are there any ongoing legal proceedings with respect to the legal ownership of the land and/or rights to develop the project?
- Is the project area inhabited and is there a plan in place to manage/relocate/work with these inhabitants? Is there a need for and plan for resettlement? If appropriate, has Free Prior and Informed Consent (FPIC) been obtained?
- What permissions/licences are required for the project and have these been secured?
- What government policies/regulations are applicable to the project at the national, state and local level and is the project in compliance with all these requirements?
- Is the regulatory/policy landscape well established or evolving? What are the expected changes to the regulatory/policy environment and the impact it may have on the project? Has this impact been adequately addressed?
- What has been the support/challenges faced by similar projects (if any) from a regulatory perspective?
- Does the project proponent have good relationships with local/regional/national government/regulatory authorities and what is the basis of this relationship?
- Is there an expectation that the government will support the project in case of any legal/regulatory distress? Have there been any previous instances of such support?
- How high is legal risk at a jurisdictional level with respect to property rights, contract enforcement, and the rule of law in general? To what extent is such risk relevant to the legal risk assessment at a project level?

Operational risk

Operational risk refers to the risks associated in operating the project as planned, post implementation. This is an equally important component of project risk assessment, as a well-executed project which cannot operate efficiently renders the project infeasible. We also assess the time to 'ramp-up' the project to full 'capacity' post implementation.

Our operational risk assessment comprises of understanding:

- How long will it take for the project to achieve 'stabilisation' post implementation?
- Does the project require specialist knowledge or expertise to operate it and if so, how is the project planning to acquire this expertise?
- Are there any specific post-implementation challenges likely to be faced by the project?
- Does the project have adequate financial resources to operate the project?
- What are the alternative funding sources for the project if there is a significant drop in the prices of carbon credits and/or a reduction/delay in the volume of credits issued by the project?
- Are there any planned changes to the project proponent/operators post implementation of the project? If so, what is the rationale for/impact of this on the project?
- How easy/difficult is it to replace any of the project operators/service providers/personnel.

Project proponent past experience

Assessment of the project proponent's background and past experience is a critical component of our assessment of implementation risk. A new, inexperienced project proponent will increase project risk as compared to an experienced project proponent.

Our experience of project proponent risk comprises understanding:

- Who is the primary project proponent and what is their background? Is the background relevant to / useful for the project?
- Who are the other stakeholders involved in the project and their respective roles?
- Do each of the stakeholders have a background/experience in their respective roles as regards the project?
- Does the project proponent have experience in implementing similar projects? How successful were they in their previous endeavours?
- Does the project proponent have experience in sourcing and managing finances of the scale required by the project?
- Does the project proponent have experience in operating similar projects (post implementation)

- Does the proponent have any outstanding legal/regulatory issues against them, and if so what could be the potential impact of these issues on the project implementation and its credibility?
- Does the proponent have a sound financial standing and are they able and willing to support the project in case of financial stress?
- Does the proponent have a track record of supporting projects/ventures in the past, especially during financial stress?
- What is the economic / other incentive for the proponent to continue supporting the project in the event of a distress?

A note on event risk

Event risk represents unforeseen events that have not been factored into the project planning. Such events are also referred to as 'force-majeure' events and are rare in occurrence. Natural disasters such as floods, fire, drought, hurricanes, are all examples of event risk, as are riots or civil disturbance. Unforeseen changes in regulations, policies, 'bans', etc. are also event risks.

BeZero Carbon's risk assessment does not factor in event risk as it is difficult to predict and occurrences are, by definition, rare.

Table 13. Project execution risk factor scoring

Project execution risk factor scoring

This risk factor is only applicable to projects that are pre-implementation and is assessed as a discount factor.

Technical/technological risk	
aaa Lowest risk	Simple, well established and commercially-proven technology and/or project configuration with minimal variables and/or dependencies.
aa Very low risk	Simple, well established and commercially-proven technology and/or project configuration with some variables and/or dependencies which are well addressed.
a Low risk	Slightly complex technology and/or project configuration with strong commercial track record; several variables and/or dependencies which could pose some risk but adequately addressed.
bbb Moderate risk	Complex but well-established technology with good availability of required specialist skills; many instances of commercial success at similar scale.

bb Moderately high risk	Complex technology and/or project configuration requiring specialist skills; some instances of commercial success at similar scale.
b High risk	Complex technology and/or project configuration requiring highly specialised skills and experience to operate; Increasing instances of technology and/or project configuration in commercial settings but at smaller scale.
c Very high risk	Some instances of technology working in research conditions and/or much smaller scale with zero or limited commercial track record.
d Highest risk	First or almost first-of-its-kind project with commercially unproven and untested technology and/or configuration at the proposed scale.

Financial risk

aaa Lowest risk	Strong standalone commercial viability of the project with minimal capital expenditure requirements; funding fully tied up.
aa Very low risk	Strong standalone commercial viability with low capital expenditure requirements; funding fully tied up.
a Low risk	Good standalone commercial viability with relatively large capital expenditure requirements; funding mostly tied up.
bbb Moderate risk	Average commercial viability with large capital expenditure requirements; funding commitments in place for most of the capital expenditure, but not tied up.
bb Moderately high risk	Project commercially breaking even with large capital expenditure requirements; funding commitment in place for less that 50% of the capital required.
b High risk	Weak standalone commercial viability with high capital expenditure requirements; some funding commitment.
c Very high risk	Weak standalone commercial viability with high capital expenditure requirements; funding plan under discussions.
d Highest risk	Very weak stand-alone commercial viability with high capital expenditure requirements and no funding plan.

Legal and regulatory risk

aaa Lowest risk	Clear legal ownership of the project site; well-established regulatory landscape with all permissions in place; no resettlement requirements required; limited stakeholders.

aa Very low risk	Clear legal ownership of the project site; well-established regulatory landscape with all permissions in place; limited resettlement requirements required but stakeholders on board.
a Low risk	Clear legal ownership of the project site; reasonably stable regulatory landscape with most permissions in place; some resettlement requirements required but strong relationship with stakeholders.
bbb Moderate risk	Clear legal ownership of the project site; reasonably stable regulatory landscape with some permissions in place; stronger engagement with stakeholders required to manage the reasonably large resettlement requirements required.
bb Moderately high risk	Some uncertainty on legal title and on permissions required for the project; most known permissions applied for, though not yet received; large resettlement requirements required; stakeholder engagement commenced.
b High risk	Some uncertainty on legal ownership of project site; stabilising regulatory landscape, though emerging clarity on required permissions; extensive resettlement requirements to be managed; large, unsupportive stakeholder group with limited engagement at present.
c Very high risk	Unclear legal ownership of project site; evolving regulatory landscape, though emerging clarity on required permissions; extensive resettlement requirements to be managed; large, unsupportive stakeholder group with limited engagement at present.
d Highest risk	Disputed legal ownership of project site; evolving regulatory landscape with limited clarity on required permissions; extensive resettlement requirements to be managed; large anti-project stakeholder group with limited engagement at present.

Project proponent/team past experience

aaa Lowest risk	Well-established project proponent with a highly experienced team with several years of highly successful track record in implementing and operating similar projects.
aa Very low risk	Highly-experienced team with several years of successful track record in implementing and operating similar projects; project proponent may not have background in similar projects.
a Low risk	Experienced team with a sound track record in implementing and operating similar projects; project proponent may have limited background in similar projects.
bbb Moderate risk	Team with some track record in implementing and operating similar projects; project proponent does not have a background in similar projects.

bb Moderately high risk	Team with limited track record in implementing and operating similar projects; project proponent does not have a background in similar projects.
b High risk	New project proponent with a team with limited experience in operating similar projects, but not at this scale.
c Very high risk	New project proponent with a team with very limited experience in operating similar projects.
d Highest risk	New project proponent with a team not yet in place or implementing and operating projects of this nature for the first time.

Operational risk	
aaa Lowest risk	Simple, well-established and commercially-proven technology and/or project configuration with minimal variables and/or dependencies; excellent availability and minimal uncertainty regarding the supply chain and financial resources needed to ensure sustainable operations.
aa Very low risk	Simple, well-established and commercially-proven technology and/or project configuration with some variables and/or dependencies which are well addressed; good availability and certainty regarding the supply chain and financial resources needed to ensure sustainable operations.
a Low risk	Slightly complex technology and/or project configuration with strong commercial track record; several variables and/or dependencies which could pose some risk but are adequately addressed; moderate availability and certainty regarding the supply chain and financial resources needed to ensure sustainable operations.
bbb Moderate risk	Complex but well-established technology with good availability of required specialist skills; many instances of commercial success at a similar scale; some uncertainty regarding the necessary supply chain or financial resources, either regarding availability or prices.
bb Moderately high risk	Complex technology and/or project configuration requiring specialist skills; some instances of commercial success at a similar scale; some uncertainty regarding the necessary supply chain and financial resources, either regarding availability or prices.
b High risk	Complex technology and/or project configuration requiring highly specialised skills and experience to operate; increasing instances of technology and/or project configuration in commercial settings but at smaller scale; high uncertainty regarding the supply chain and financial resources, regarding both availability and prices.

c Very high risk	Some instances of technology working in research conditions and/or at a much smaller scale, with zero or limited commercial track record; significant uncertainty regarding the necessary supply chain and financial resources, regarding both availability and prices.
d Highest risk	First or almost first-of-its-kind project with commercially unproven and untested technology and/or configuration at the proposed scale; unclear on how the project proposes to source inputs and financial resources to sustain operations.

Analytical process

The ex ante rating analytical process incorporates a number of distinct steps:

Step 1: Information and data review

BeZero Carbon will review the information provided and confirm if it is sufficient to be able to assess the project. Additional information may be requested as required. In the instance when the customer is not able to provide the required information, BeZero Carbon will not be able to undertake the rating assignment. Please refer to Appendix 1 for examples of the information required.

Step 2: Information and data processing

BeZero Carbon will assign a team of analysts to carry to work on the rating assignment. The team will work closely with the data analytics team to standardise the carbon accounts using the BeZero Carbon Accounting Template and curate the information to make it comparable to internal databases, reference sources etc. The team will also work with specialists in the Geospatial and Earth Observation and/or Research teams as necessary to carry out an independent assessment of proposed project boundaries, natural hazards, policy context, etc. as required.

If required, the team will then prepare a list of questions and clarifications required from the project stakeholders.

Step 3: Risk factor assessment

The ratings team will carry out a top-down and project-specific analysis of project activities, claims, characteristics, and carbon accounts. This will follow a detailed assessment of additionality, carbon accounting, non-permanence, and project execution risk, following the framework outlined in the previous section.

The team may also interact with the project team and other stakeholders to refine its understanding and to seek additional information and clarifications. The team may also visit the project site if it (or the project team) believes will aid the team's understanding of the project activities and inform the assessment. Any information risks will, where appropriate, be reflected in our assessment of the relevant risk factor.

Step 4: Assigning an ex ante rating

The team will analyse the information provided, may meet the project proponent and other stakeholders and visit the project site if deemed necessary.

The ratings team will complete their analysis and prepare a draft report. This report will be peer reviewed by at least two other analysts who have not worked on the assignment. It will then be reviewed by the sector lead as well as members of the Ratings leadership team. The report thus finalised will be submitted to the Rating Committee for consideration, which is the sole body that can assign BeZero Carbon Ratings (ex ante or ex post).

The Rating Committee is made up of members of the Ratings team and senior members of the Ratings and Research teams. The committee is subject to quorum requirement and is chaired by one

of the senior members of the Ratings and Research organisation (e.g. the Director of Ratings or Chief Research Officer). Members of the GEO team must attend in the case of NBS projects.

All rating analysts are invited to attend and participate in the deliberations. At the committee, the lead analyst presents their analysis and rating recommendations. The Rating Committee's role is to interrogate their recommendation by asking questions and/or seeking clarifications. If the Rating Committee requires additional information or clarification which cannot be addressed at the meeting, the rating cannot be assigned until all outstanding issues are deemed as resolved by the committee. Unanimous approval by the Rating Committee is required for a final rating to be assigned.

We will then communicate the ex ante rating along with a detailed report on its assessment of the various risk factors, as detailed in the methodology document. BeZero Carbon's analysts will be available to discuss/explain the analysis and answer any questions.

There is potential for BeZero Carbon to receive new information and/or additional clarifications in these post-rating discussions. In such a case, the ratings team will prepare and submit an update note to the rating committee for its consideration. The team will then communicate the updated decision to the customer.

At this stage, the initial rating process will be completed.

Step 5: Periodic review

The ex ante rating will be reviewed and updated periodically - as a general rule annually - until all the carbon credits generated by the project are issued. This implies that projects will have both an ex ante rating and an ex post rating over its crediting period. Table 14 shows sample vintage splits and ratings over a sample project's 30-year crediting period.

Table 14. Illustrative ex ante and ex post ratings

Year	Stage	Ex ante rating (vintage)	Ex ante rating (rating)	Ex post rating (vintage)	Ex post rating (rating)
2023	Implementation	2025-2055	Be	n/a	n/a
2025	Operational, no credits issued	2025-2055	BBe	n/a	n/a
2030	1st crediting period - 5 years	2030-2055	BBBe	2025-2030	A
2040	2nd crediting period - 10 years	2040-2055	Ae	2025-2040	A
2050	3rd crediting period - 10 years	2050-2055	Ae	2025-2050	A
2055	4th crediting period - 5 years (All credits issued)	n/a	n/a	2025-2055	A

Exhibit 2. Illustrative example of a 5-year project

Year of project	2024	2025	2026	2027	2028	2029	2030	2031+
Phase of project	**Phase 1** Design At design stage	**Phase 2** Implementation Being implemented	**Phase 3** Pre-issuance Operational pre-issuance All credits are ex ante		**Phase 4** Issued Operational and 1st vintage 2026-2027 issuance completed			**5-year project completed** 2nd and final issuance of vintage 2028-2030 completed
Crediting period coverage	Ex ante applicable for all project lifespan 2026-2030				Ex post applicable for 2026-2027 vintage only			Ex post applicable for full project lifespan 2026-2030

The periodic review/update is dependent upon timely submission of updated information by the customer or project proponent.

The customer is responsible for providing BeZero Carbon with all information (as per the information list) to facilitate the annual review. In addition, the customer should keep BeZero Carbon updated with any material updates / changes to the project which could potentially have an impact on the rating.

At the completion of the annual review, BeZero Carbon will issue an updated report along with the updated rating, as applicable. The review report will be valid on the date of the issue and will follow the same protocol as regards access and redistribution rights.

Appendix I: Analytical independence

BeZero Carbon acts as an independent third party and is not conflicted in delivering the ex ante rating for the following reasons:

- BeZero Carbon's analysis and the resulting ex ante rating is limited to our assessment of the risks associated with the information provided and expressed as a risk metric.
- BeZero Carbon does not provide any recommendations or advice on how to change or improve the project.
- BeZero Carbon does not create standards for, develop, invest, or transact in carbon projects. The only exception is the retirement of carbon credits for the explicit purpose of compensating for its own carbon footprint.
- BeZero Carbon does not verify, validate, sanction or in any way influence the number credits issued by the project.
- BeZero Carbon is not incentivised commercially or in any other sense to deliver a specific rating outcome at the time of assignment or at any time in the future.
- All members of BeZero's analytical team, including the committee members, are commercially independent of the assigned ratings - i.e. their compensation, benefits, or performance measures are not in any manner linked to the ratings assigned.
- All BeZero staff, including all members of the ratings team, adhere to strict compliance procedures, including, inter alia, prohibition from holding and/or dealing in carbon credits and annual reporting. These standards are akin to standards practised by financial market rating agencies.
- BeZero Carbon has implemented a Rating Committee process across ex ante rating and ex post ratings processes, which mitigates the undue influence of individuals on the overall ratings process outcome.

Appendix II: Information required

The following information is required (where applicable to the project type) in order for a rating to be assigned:

Project Key Information

No.	Information required	Explanation
1.	Project description	Full details on the project including a description, objectives, location, proposed activity/technology etc.
2.	Project proponents	Full details of all the entities/key people involved/required/proposed to be involved in the project (proponent, sponsor, project team, contractors, specialists etc.); their background and interconnections; experience and past track record in similar projects for each such entity/person and the status of their onboarding.
3.	Project timelines	Overall project timelines: start date, implementation period, stabilisation period, operational period, credit issuance period, commitment period, and key risks to plan.
4.	Information access	Listing of and access to data sources considered important by the project proponent/requesting party for BeZero Carbon to assign ex ante ratings. Plans in place to enable BeZero Carbon to retain such access through the period during which BeZero Carbon will monitor the project's rating.

Project Activities

No.	Information required	Explanation
5.	Activity precedence	Note on the uniqueness or prevalence of the project activity/ technology and example(s) of successful implementation and operations of similar projects (at the same scale), as applicable.
6.	Previous projects	If a similar project has been previously implemented, the key challenges faced by such projects and how they were overcome How has the project factored in these learnings and the likelihood of success.
7.	Counterfactual	Details of the counterfactual: what would likely happen in the absence of the project activity and the basis of making this assertion.

8.	Feasibility & Setup	Detailed project or techno-economic feasibility study. Supporting reports or documentation to inform an assessment of project setup or implementation e.g. budget, plan and contracts related to project implementation, rollout or construction.

Legal & regulatory

No.	Information required	Explanation
9.	Regulation	Details of the regulatory and policy landscape applicable to the project; permissions/licences required and their status.
10.	Government stance	A note on the government's support/views as regard the project activities along with project proponent's view/opinion (if any) on willingness and track record of support to the project from the government, if required.
11.	Corresponding adjustments	Details of corresponding adjustments proposed or likely to be carried out for the carbon credits issued by the project.
12.	Ownership & land rights	Details on who owns the land and/or equipment required for the project and the basis and nature of rights acquired by the project to enable project implementation and operation through its lifetime.
13.	Outstanding legal issues	Details of any outstanding legal and/or regulatory issues against the project proponent and, if so, details on the potential impact of these issues on the project's implementation and its credibility.

Financial

No.	Information required	Explanation
14.	Financial analysis	Detailed financial model and financial feasibility study covering the full project timeline highlighting: income from carbon finance, income from sources other than carbon finance, capital cost/initial investment to set up the project, ongoing cost to manage/operate the project, net cash flows from the project, and financial return parameters including IRR/Payback periods etc. with and without carbon finance.
15.	Funding	Details on: the sources of funding for the project and the status of tying up the funding required; what risks (if any) there are to

		the availability of funds needed to implement the project and during its operational phase; the project proponent's experience in raising funds from the proposed sources.
16.	Insurance	Details on the nature and quantum of insurance coverage the project is proposing to take.
17.	Financial track record	Details on project proponent's financial standing and past track record regarding the ability and willingness to support the project in case of financial or other difficulties.

Stakeholder Relations

No.	Information required	Explanation
18.	Stakeholder landscape	Details on local stakeholder landscape: who are the key stakeholders for the project activity, would any of them be affected by the project and/or could they have objections to the project activities; engagement (if any) with these stakeholder groups; plans to manage these stakeholders, especially those who are or could be opposed to or affected by the project.
19.	Resettlement and/or FPIC	Is the project area inhabited and is there a plan in place to manage/relocate/work with these inhabitants? Is there a need for and plan for resettlement? If appropriate, has Free Prior and Informed Consent (FPIC) been obtained/proposed to be obtained?
20.	Counterparties	Details on: the key counterparties and/or contractors involved in the project and required for its successful completion and operations; the status of their onboarding/tie-ups; what alternative plans are in place should the stakeholder be unable or unwilling to work with the project towards its success.

Carbon accounting & fundamentals

No.	Information required	Explanation
21.	Additionality	Note on how the project proposes to establish 'Additionality' for the project. If considered 'automatically' additional, the reference to the accreditor/criteria forming the basis of such conclusion.

22.	Carbon accounting template	BeZero Carbon's ex ante carbon accounting template for the project's lifetime - project emissions, leakage, risk buffer allocation, and baseline.
23.	Carbon accounting detail	Details on carbon stocks calculations (biomass, plots, allometric equations, degradation, and sampling).
24.	Leakage belt	Definition of the leakage belt and the appropriateness of such selection in the context of the project. Detailed leakage models including underlying assumptions and information regarding historical and expected forest loss/other leakage elements.
25.	Risk buffer	Note on risk buffer assessment, including likelihood of fire, drought and other risks occurring and how these are proposed to be mitigated; if a risk buffer contribution is being proposed, then the basis of its determination and appropriateness.
26.	Baseline models	Baseline models, information on protected areas in the project area or reference region, and an effectiveness index if calculated by the project.
27.	MRV	The plans/frequency and organisations that will be responsible for monitoring and verification of the project activities, their background and experience in the region and for similar projects.
28.	Geospatial data	Georeferenced spatial files (e.g. KML, shapefile) for the project area and any other locations relevant to the project design (e.g. leakage belt and reference region)
29.	Deforestation data	Information regarding historical deforestation and activity trends in all relevant areas - Historical period - Reference region

Appendix III: Comparison between Risk Assessment Report and Rating Report

BeZero Carbon offers two types of ex ante reports.

Ex ante risk assessments is an alternative to **ex ante ratings** for customers who need a less granular assessment or who wish a shorter turnaround time.

Although the same five risk factors are scored, the risk factors assessment is less detailed and there are no ratings. The information requirements and distribution rights are the same.

The table below summarises the difference between the two ex ante reports.

	Risk assessment report	Ex ante rating report
Executive summary	✔	✔
Carbon risk factor score and assessment	✔	✔
Detailed risk factor analysis	X	✔
Standalone carbon rating	X	✔
Project execution risk	✔	✔
BeZero Carbon ex ante rating	X	✔

Appendix IV: 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.

Appendix V: Sustainable development goals

Applying the equality SDGs to the VCM
A focus on climate action: Sustainable Development Goal 13 claims in the VCM
Transparency is key for SDG claims to be an effective asset in the VCM
Interpreting SDG claims in voluntary carbon projects
Time to rethink biodiversity: SDG 14 & 15
Eye for detail: buyers want to know the evidence behind SDG claims
Lost in translation: SDG claims are more than meets the eye
How robust are SDG 3 & 7 claims in the VCM?
Mapping the SDG claim lifecycle: 2023 update
Applying the equality SDGs to the VCM
How economic SDG claims can be impactful in the VCM

Updates and reviews

Version number	Date	Description
1.00	14/07/23	Initial release
2.00	03/11/23	Addition of Appendix III
2.01	31/01/24	Revised information risk factor scoring; Formatting updates
2.02	03/09/24	Removal of information risk as a discount factor

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The Document may contain information related to BeZero Carbon ex ante Rating. The BeZero Carbon ex ante Rating (the "**ex ante rating**") represents BeZero Carbon's opinion, as of the date of the rating report, on the likelihood that carbon credits which may be issued by a project will achieve a tonne of CO_2e avoided or removed. The ex ante rating (together with the rating report), sets out BeZero Carbon's opinion on a particular carbon credit or project based on information that has been provided to BeZero Carbon or information that is publicly available as at the date expressed and BeZero Carbon shall have no liability to anyone in respect of the ex ante rating. The ex ante rating (together with rating report) is a statement of opinion as at the date expressed and does not constitute a solicitation, recommendation or endorsement by BeZero Carbon or any third party to invest, buy, hold or sell a carbon credit and/or to invest in a specific project. The ex ante rating (together with the rating report) neither recommends nor will recommend how a project could achieve a particular carbon credit rating outcome. The ex ante rating may relate to future events, the outcomes of which are inherently uncertain and subject to a range of factors and risks which may alter the accuracy or relevance of the ex ante rating at any time. The ex ante rating should not be relied upon and is not a substitute for the use of your independent skill and judgement in relation to the making of investments or other business decisions.

If you have any questions about BeZero Carbon, the BeZero Carbon ex ante Rating, the BeZero Carbon ex ante Rating methodology, the BeZero Carbon Rating, the BeZero Carbon Rating methodology, qualifying criteria, rating process, the BeZero Carbon Markets platform or otherwise please contact us at: commercial@bezerocarbon.com.