BeZero Carbon Ratings: Methodology White Paper

Key takeaways

The BeZero Carbon Rating (BCR) is a proprietary framework blending top-down & bottom-up approaches to assess the efficacy of voluntary offsets.

It is a weighted score of six risk factors, combined to assess the probability that a carbon credit successfully achieves the removal or avoidance of one tonne of CO_2e.

The BCR drives market efficiency by acting as a metric for true cross-credit carbon fungibility; it is a tool to understand carbon quality; enables carbon asset liability matching.

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1   Introduction

Introduction

BeZero provides Climate Asset and Liability Management Solutions. Our primary goal is to assist clients in decarbonising. This requires a commitment, and toolkit, to understand and source the highest quality carbon offsets via the voluntary carbon offset market (VCOM).

We find the VCOM underdeveloped, opaque, and inefficient. In particular, the focus is too rarely on the carbon efficacy of a project. Projects are sold on their co-benefits or basic attributes. A credit's carbon "return" is taken as binary; either it is accredited by a recognised certification body or it isn't. The topic of post-certified carbon "fundamentals" is poorly understood and uncharted.

This is at odds with the rise of ESG and emphasis on corporate climate action, which is driving dramatic growth in the VCOM - transactions are set to rise from $2bn to $100bn by 2030. Buyers need carbon assets that match their carbon liabilities; sellers need information to make informed decisions about the type of economic returns associated with different projects; the VCOM needs a tool to better understand whether each credit for purchase is truly equatable to a tonne of carbon.

The BCR fulfills this function. It is a proprietary framework blending top-down & bottom-up approaches to assess the CO_2e efficacy of voluntary offsets. Its primary output is a weighted score discounting the probability that any given carbon credit is successfully achieving the removal or avoidance of one tonne of CO_2e.

The BCR serves three core functions: to drive market efficiency by acting as a metric for true cross-credit carbon fungibility; as a tool to understand carbon quality; as a means of companies achieving effective carbon asset-liability matching.

1.1   Introduction

Methodology Summary

Carbon offsets are by definition imprecise; in order to be an 'offset' we need to be sure it would not have happened otherwise. Given we cannot observe this 'otherwise' scenario - the counterfactual - there is always some degree of uncertainty involved in offsetting.

In the absence of observable data on the performance of carbon credit projects, our methodology for rating carbon offsets provides a consistent and robust framework for assessing the carbon efficacy of different project types.

This white paper breaks our ratings approach down into five stages:

Stage 1 - define the key risk factors offset projects are exposed to

Stage 2 - construct a top down view of the market by scoring our risk factors across sectors

Stage 3 - conduct a project-level bottom up assessment

Stage 4 - calculate the BeZero Carbon Rating using our risk factor weighting

Stage 5 - details how we use the rating internally and future developments we are working on

We have identified six risk factors that may lead to variations in the carbon achieved by an offset project:

Additionality: the likelihood that a credit purchased and retired leads to a tonne of CO_2e being avoided or sequestered that would not have otherwise happened.

Over-crediting: the risk that more credits are issued than tonnes of CO_2e achieved by a given project due to factors such as unrealistic baseline assumptions.

Permanence/enforceability: the degree of confidence that carbon avoided or removed by a project will remain so for the time committed.

2   Understanding the key risk factors facing offset projects

Leakage: the risk that emissions avoided or removed by a project are pushed outside the project boundary.

Perverse incentives: the potential for benefits from a project, such as offset revenues, to incentivise behaviour that reduces the carbon efficacy of its credits.

Political environment: the degree to which activities impacting an offset project are supported or blocked by government policy or actions.

These risk factors are not mutually exclusive, and are ranked as follows:

Risk factor	Importance	Explanation
Additionally	Critical	To truly be an 'offset' the carbon avoided or stored must only have occured due to the creation of the project and purchase of the credit.
Over-crediting	Primary	The total Greenhouse Gas (GHG) removal or avoidance is critical for assessing the probability that a credit achieves a tonne of CO_2e. The accuracy of baselines strongly determines how much GHG is offset.
Permanence/ enforceability		Nature-based carbon credits risk trend reversal within the committed project timeframe. The probability of delivery also requires assessment.
Leakage		Likelihood that local or national activities increase emissions.
Perserve Incentives	Secondary	Minimising the extent to which behaviours are aligned with the desired carbon or conservation outcomes drives offset quality.
Political Environment		Local, national and international conditions & legislation can have significant, if less direct, bearing on offset quality.

2.1   Understanding the key risk factors facing offset projects

In order to avoid a potential overlap of risk factors, the definitions applied become increasingly narrow as the relative importance decreases (i.e. additionality has the broadest definition while political/policy drivers & perverse incentives have the narrowest). This is in order to avoid what is called multicollinearity if regression analyses were being used.

The BCR does not include:

Double counting: the rating is not an assessment of the efficacy of any registry and its intersection with government policy. For example, we do not consider corresponding adjustments.

Time: our assessment focuses on the efficacy of the commitment made by a project through the accreditor. We do not compare the permanence requirements across accreditors, nor an offset's vintage independent of a methodology's assessment.

2.2 Understanding the key risk factors facing offset projects

Scoring Buckets

Each risk factor is scored according to the same assessment; what is the probability that a credit from a given project achieves a tonne of CO_2e avoided or sequestered? In this way, our scoring applies **a discounting approach**; evidence is used for each of the risk factors (where evidence is available) to determine the extent to which a credit should be discounted based on our assessment of the exposure to this risk.

The table below details the general approach taken across risk factors. For the scoring bucket definitions for each individual risk factor, see Appendix 1.

Score	Driver
100% probability of sucess	Balance of evidence suggests this scoring factor poses **no risk** to a credit achieving a tonne of carbon.
90% probability of sucess	Balance of evidence suggests this scoring factor poses **little risk** to a credit achieving a tonne of carbon.
70% probability of sucess	Balance of evidence suggests this scoring factor poses **some risks** to a credit achieving a tonne of carbon.
50% probability of sucess	Balance of evidence suggests this scoring factor poses **a notable risk** to a credit achieving a tonne of carbon.
30% probability of sucess	Balance of evidence suggests this scoring factor poses **significant risks** to a credit achieving a tonne of carbon.
0% probability of sucess	Balance of evidence suggests this scoring factor poses **serious risks** of a credit achieving no carbon.

The 'balance of evidence' refers to the expert opinion of our team of carbon credit scientists informed by the general consensus from the literature. 'Studies' refer to individual papers, while 'arguments' mean specific lines of reasoning that support a given claim about a certain type of risk and project type.

2.3 Understanding the key risk factors facing offset projects

Our team of carbon credit scientists interpret the use of potentially subjective and qualitative language like 'minimal', 'significant' and 'notable'. However, these guidelines should be sufficient to score most project types for most risk types adequately.

The scoring buckets run from 100% to 30% to capture the range of discounting we judge as appropriate in the market. The rating does not go below 30% unless we can confidently make an assessment that a project has failed based on a given risk factor and credits should be entirely discounted.

If no evidence is available, then no score is given and the risk factor is dropped, with the remaining reweighted. For a project score to 'pass' our review, a minimum of 80% of the total risk factor weighting must be accounted for (see stage 4 for risk factor weightings).

Factors beyond Carbon

The BCR is designed in the context of offsets being carbon assets. It seeks to answer the question of how much carbon a given offset will return. There are broader factors beyond carbon that market participants may wish to consider when engaging with offset projects, some of which are better measured and documented than others.

Biodiversity & Water Quality: water i.e. "does not account for biodiversity or water quality" our rating does not account for the impact a carbon project has on biodiversity. While some elements of a poor biodiversity score may feed into the BCR (for example, monoculture forests may be more susceptible to disease and therefore reversals), we recommend that buyers use the rating as part of a suite of tools to assess the broader impact of a carbon project. We are in the preliminary stages of building a broader natural capital assessment tool which utilises the BCR as an input.

Socioeconomic factors: there is a greater role for certain socioeconomic factors in the rating, with these considerations being captured by leakage or permanence, where relevant. For instance, the data on rights of indegenous people, stakeholder fatigue, consultations and replacement of practices that have cultural or heritage values are included in the BCR. In addition, most accreditation processes require project developers to ensure "free, prior and informed consent".

3   Taking a top-down view of each risk factor
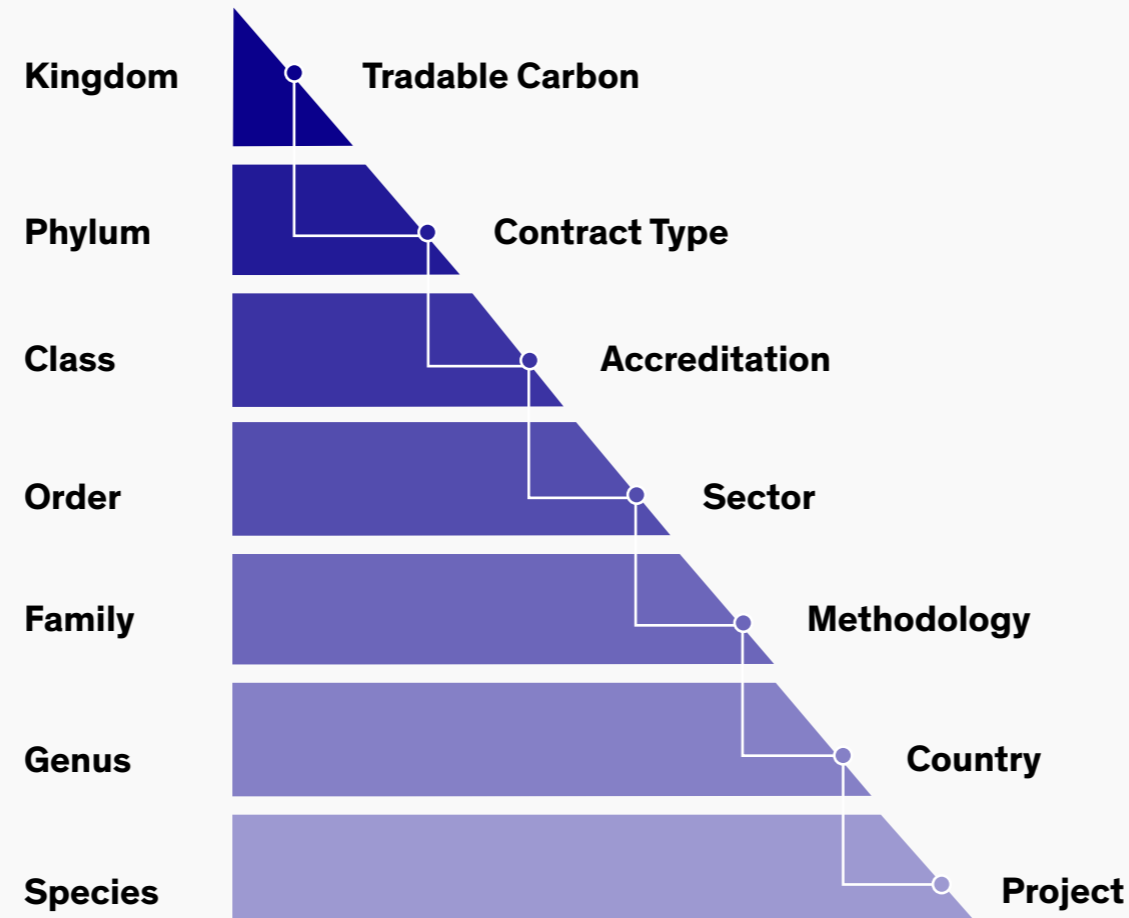
**BeZero's Taxonomy
of Carbon Credits**

Figure 1 : BeZero's representation of the tradable carbon universe using a Linnaean taxonomy.

Our taxonomy of the voluntary offset market enables us to clearly define our approach to rating carbon offsets from both a top down and bottom up perspective. Using a waterfall approach, we have developed a top down view from class (accreditation) down to genus (country) and married this with our project level analysis.

3.1   Taking a top-down view of each risk factor

Top down analysis steps

Order = sector

The BCR database is used to assess projects in general within a sector. For instance, literature assessing sector-wide carbon efficacies may describe the poor additionality of certain sectors based on the cost-competitiveness of the intervention and/or the role of carbon finance.

Family = methodology

The extent to which a certified, project-specific methodology suffers from or mitigates the risks identified at the sector level. For example, the validity of buffer pools to mitigate permanence.

Genus = country

We analyse the impact individual country policies or factors may have on our risk factor scores. For example, the country-specific barriers affecting additionality of methane avoidance in commercial livestock manure management. We also feed in country-specific data, such as the penetration of technology types, policies and property rights.

BCR Databases

The BCR database is the one of the largest privately compiled and curated libraries of secondary literature assessing carbon offset projects, their methodologies and associated risks. This database currently contains 540 entries covering 17 sectors (condensed to 11 in the chart below). It consists of peer-reviewed, and non-peer reviewed reports sourced from professional research institutes and/or policy organisations and public databases. All entries within the BCR database are publicly available and traceable. We use keyword searches to gather a broad range of research relevant to all the offset project types covered, and keyword alerts to stay up to date on all the latest published research. Our database of sources is labelled according to which sector and/or country it is relevant to. Qualifying papers have been assessed to understand the extent and scope of their data, how the data is analysed and what inferences can be made. For example, arethe appropriate statistics performed during data analysis, are the conclusions justified, etc.

3.2   Taking a top-down view of each risk factor
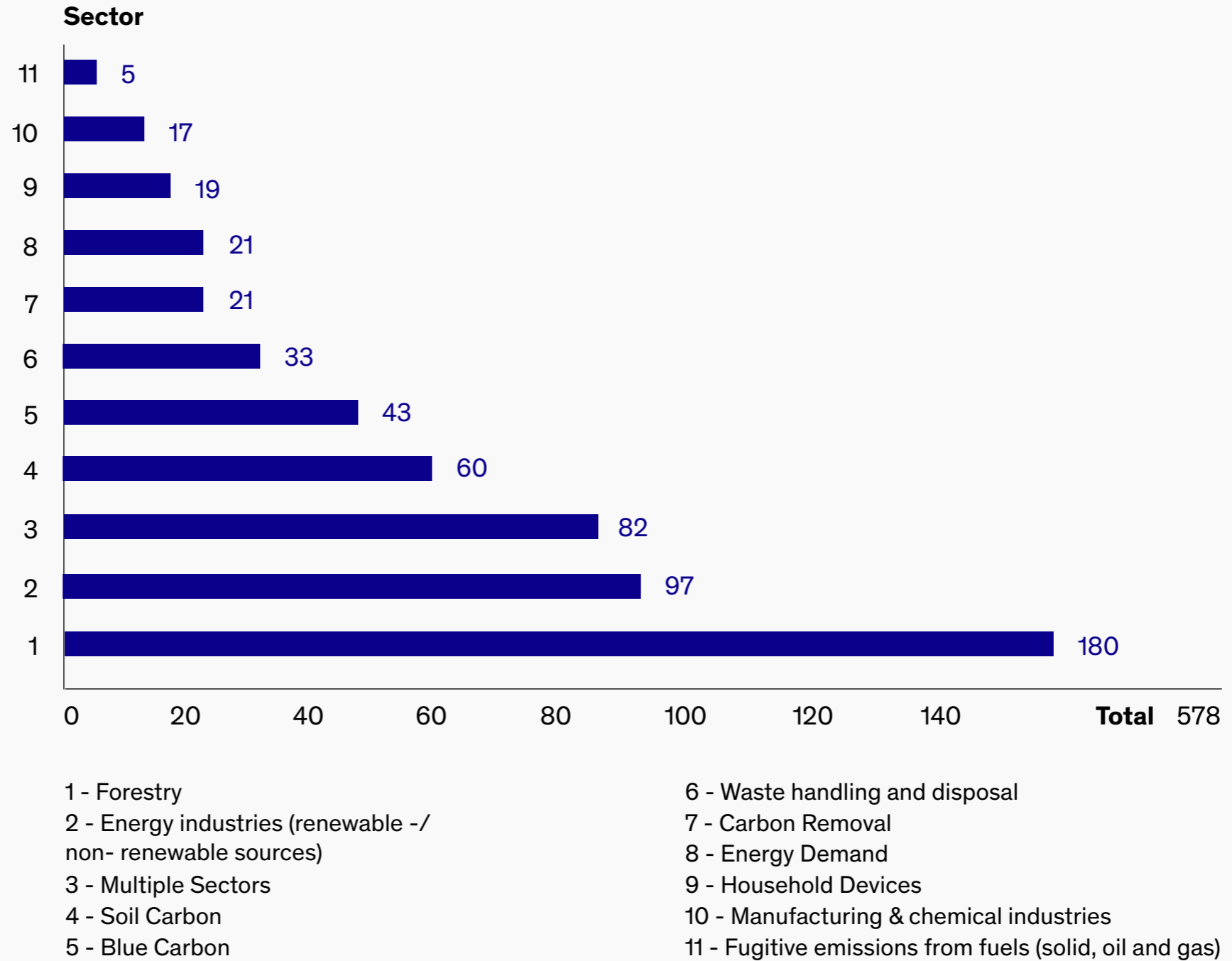
**Number of sources
by sector**

Sector

Sector	Count
11	5
10	17
9	19
8	21
7	21
6	33
5	43
4	60
3	82
2	97
1	180

Total 578

1 - Forestry
2 - Energy industries (renewable -/
non- renewable sources)
3 - Multiple Sectors
4 - Soil Carbon
5 - Blue Carbon

6 - Waste handling and disposal
7 - Carbon Removal
8 - Energy Demand
9 - Household Devices
10 - Manufacturing & chemical industries
11 - Fugitive emissions from fuels (solid, oil and gas)

Figure 2 : BeZero's carbon offset related literature database.

4   Modelling bottom-up carbon returns

Data from external institutions are also included to provide quantitative support for broader qualitative assessments. For instance, a number of World Bank indicators are used to inform our scoring of permanence. For energy-related projects, data from the International Renewable Energy Agency (IRENA) country profiles was examined to gauge penetration rates. The Carbon Plan database was also used to acquire information on offset project efficacy.

Our bottom-up approach begins with an assessment of the project documents. We evaluate the project description document, monitoring reports and validation reports. Where relevant, loss event reports and other supporting documentation are also examined.

Each document is examined for information on how additionality is gauged, how baselines are set, what permanence buffers are assigned, how emission reductions and leakage are calculated and what other risks the developer has accounted for.

Following this initial investigation of project documents, external information sources are then incorporated. First our existing database is scanned for any project specific data. Next a broader online search is conducted to acquire any further relevant information on the project, with an assessment done on the strength and validity of the source or evidence before inclusion.

Primary data/evidence

We are working to constantly integrate more evidence into the scoring framework. This includes primary data, such as GIS analysis of nature based projects, which can help to inform the scoring of additionality, over-crediting, leakage and permanence. By estimating the biomass (above or below ground) within the project boundary, around the project boundary and within any reference area over time, we can assess the accuracy of some of the carbon calculations made within project documentation.

4.1   Modelling bottom-up carbon returns

Ratings timeline

We are proponents of shifting more of the activity in the offset market to exchanges in order to increase the transparency on price and liquidity. This is in line with our broader goal of bringing greater information transparency to the voluntary offset market. In order to maximise use of the ratings on exchanges and other venues, we aim to meet the following timelines:

1. Provisional automated rating: we are building an algorithm that will use our existing database of sector level views and individual project ratings to generate an automated provisional rating when a new project is posted to us.

Expected delivery time = currently one day.

2. Provisional rating: one of our carbon credit scientists generates a full provisional rating by combining our top down view with a bottom up analysis of the project, including a review of the accreditation documentation.

Expected delivery time = currently two days.

3. Full project rating: our team of carbon credit scientists meet weekly to review all new projects rated that week. A project's rating moves from being 'provisional' to 'full' once it passes the team's review. Any projects that require further analysis or review will be delayed to the following week's meeting.

Expected delivery time = one to two weeks.

4. Review of existing rating: BeZero are constantly seeking and gathering new evidence and data to feed into our model and assessments. The team will hold monthly sessions to review any new information that is believed to impact existing ratings, with changes made on the last Friday of every month. This includes the release of updated project documentation.

5   Creating the BCR Score

Risk Factor Weightings

In order to generate a single score for each project, we apply a weighted average of our risk factor scores. In order to maintain the fungibility of the BeZero Carbon Rating across the offset market, we use the same weightings across all scores.

If the true carbon return per credit were observable, we would derive the risk factor weights as the regression coefficients of the risk factor scores on carbon returns. In the absence of this data, we use our alternative evidence and research to back out our best estimate of indicative weightings.

Our starting point is allocating the 100% weight available across our six risk factors. We use the rankings of our risk factors laid out in Stage 1 and our assessment of each risk factor's relative importance to our central assessment of a credit's likelihood of achieving a tonne of carbon to derive our weightings. We have also used bottom up assessments to calibrate and validate these weightings (see our case study on a renewable energy project in China).

Subsequently, we modelled potentially 'extreme scenarios' that could arise from these weightings to check if they were appropriate (see Appendix 2).
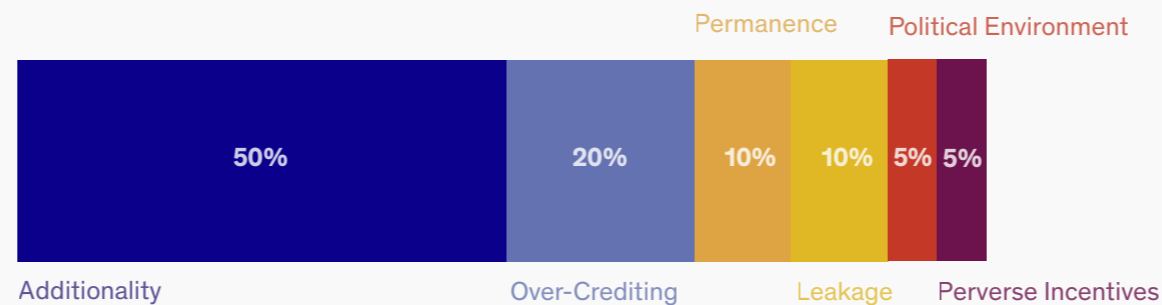

Figure 3: BeZero Carbon Rating risk factor weightings.

5.1   Creating the BCR Score

Risk Factor Weightings

The overall project score is calculated as a weighted average of the individual risk factor scores. Unscored risk factors receive a weighting of zero in this calculation. For a project score to 'pass' the BeZero review, a minimum of 80% of the total risk factor weighting must be accounted for. The final score is our assessment of the overall probability that a credit issued by a project achieves a tonne of CO_2e.

Uncertainty

The final is our point estimate of the probability a credit is achieving a tonne. If BeZero had the data to run this as a regression, it would be a point estimate along with a confidence interval based on the sample size and strength of the relationship. The uncertainty of the point estimate is not reflected in the underlying scoring for the rating. We are in the process of developing this as a separate risk score, explained in more detail in the next section.

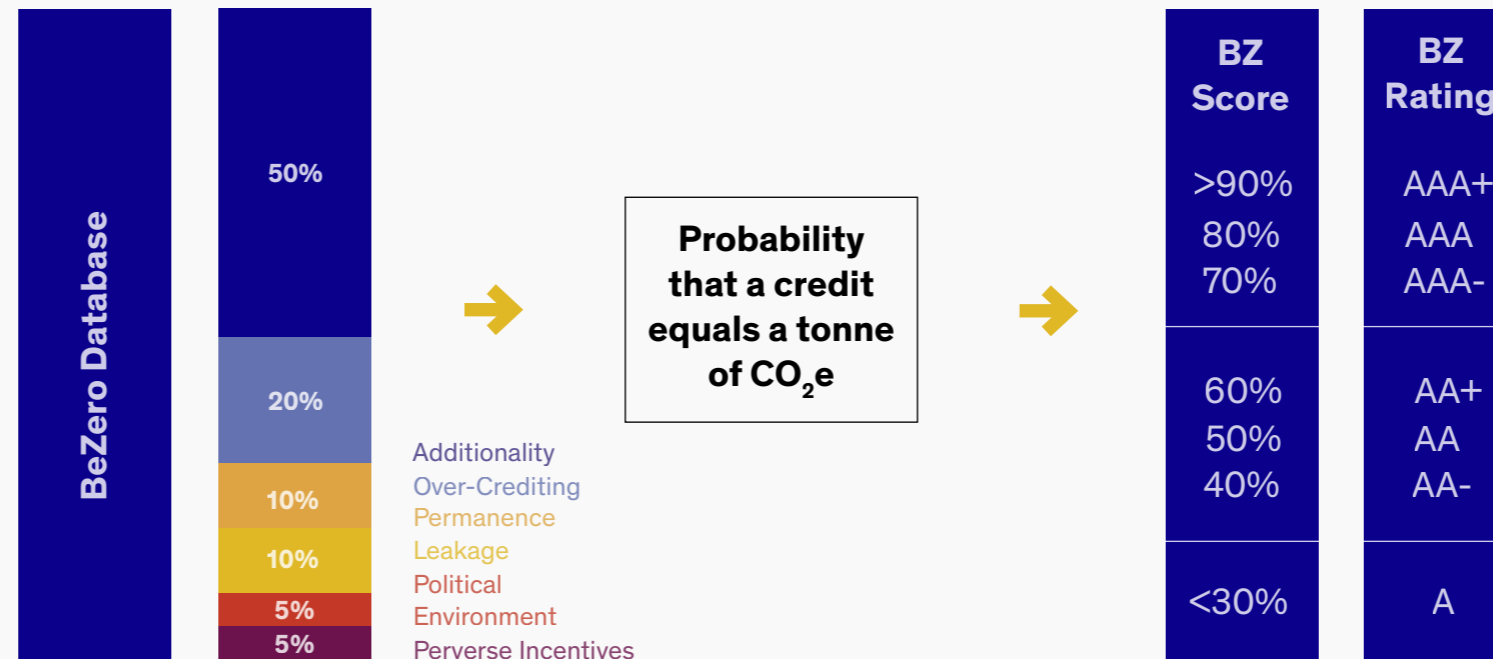**Conversion table: Probability point estimate to letter-based rating**

Figure 4: BeZero Carbon Ratings process.

6   Using the BeZero Carbon Rating

Offsets as a carbon asset

The rating system was built to enable us to think about offsets as a carbon asset. Beyond the information our letter ratings provide, we use the underlying probability score as an expected carbon return for each credit. Financial portfolio theory uses three metrics to construct optimised portfolios; expected return, risk and covariance. Below we explore how this enables us to use the rating as a tool to implement traditional financial portfolio optimisations for clients.

Expected return

The BCR is our assessment of the probability of success, where success is a credit achieving a tonne of carbon removed or avoided. By defining offset returns as a binary success or fail, they can be modeled using a geometric distribution: $g(x; P) = P * Qx - 1$ where x = no. of trials, P = probability of success, Q = probability of failure (1-P).

Given that offsets only have a single period return (or are a one-shot game), this simplifies to $g(x; P) = P$ when x = 1.

This metric alone enables us to construct portfolios around a target carbon return. For example if the targeted carbon return is 10 tonnes using a single project whose credits score 50% then we would recommend purchasing 20 credits to achieve this.

Risk and Covariance

The expected return does not tell us how to mix different projects in a basket of credits. In order to build these baskets in the same way one would construct an optimised portfolio of assets, we need to know the risk (or standard deviation) of each credit's return and its covariance with other credits.
We are developing a model for both of these metrics which we use internally to build baskets for our clients. This approach accounts for both the tangible and intangible parts of the uncertainty underlying BeZero Carbon Rating. The tangible uncertainty refers to the direct carbon calculations carried out by the project; how big is the sample versus the population? The intangible refers to the unmeasurable parts of the carbon calculation; how much evidence is there contributing to our assessment? This is beyond the scope of this paper.

7 | Appendix 01

APPENDIX 1
Risk factor scoring bucket definitions

Risk Factor	Scoring Bucket					
	0%	**30%**	**50%**	**70%**	**90%**	**100%**
Additionality The likelihood that a credit purchased and retired leads to a tonne of CO_2e being avoided or sequestered that would not have otherwise happened	No measures to verify additionality have been undertaken or projects have failed to address risks.	Balance of evidence suggests that projects are highly non-additional because few barriers exist (e.g. practices are common, offset credit finance represents a tiny proportion of overall revenue, activities are legislated for).	Balance of evidence suggests that a) projects are marginally additional; b) projects are additional in certain cases or c) contradictory evidence exists regarding additionality.	Balance of evidence suggests that a) projects are additional; b) projects are mostly additional except in some limited cases.	Balance of evidence suggests that the project is highly additional because significant barriers exist to prevent project activities (e.g. political, financial, technological etc).	The sole purpose for such projects is carbon removal and without carbon finance, projects are entirely unviable (eg: direct-air capture).
Over-Crediting The risk that more credits than tonnes of CO_2e achieved are issued by a given project due to factors such as unrealistic baseline assumptions.	No measures to verify baselines have been undertaken or projects have failed to address risks.	Balance of evidence suggests that inflated baselines or over-crediting risks exist.	Balance of evidence suggests that a) somewhat significant over-crediting and/or non-conservative baselines or b) very significant risks that are somewhat mitigated by methodology.	Balance of evidence suggests that a) baselines are mostly conservative and over-crediting risks are minimal or b) that the methodology effectively mitigates these risks.	Evidence suggests that over-crediting risks are minimal.	Evidence indicates that over-crediting risks do not exist.
Leakage The risk that emissions avoided or removed by a project are pushed outside the project boundary.	No measures to verify leakage emissions have been undertaken or projects have failed to address risks.	Balance of evidence suggests that notable (under all conditions or with significant/far-reaching impact) instances of leakage exist.	a) Balance of evidence indicates instances of leakage or b) significant instances of leakage that are somewhat mitigated by methodology.	Balance of evidence suggests that leakage risks exist but are a) minimal or b) effectively mitigated against by methodology.	Evidence suggests that leakage risks are minimal.	Evidence indicates that leakage risks do not exist.

7.1

APPENDIX 1
Risk factor scoring
bucket definitions

Risk Factor	Scoring Bucket					
	0%	**30%**	**50%**	**70%**	**90%**	**100%**
Permanence /enforceability The degree of confidence that carbon is avoided or removed by a project will remain so for the time committed.	No measures to verify perma-nence have been undertaken or projects have failed to address risks.	Balance of evidence suggests that notable (under all conditions or with significant /far-reaching impact) instances of non-permanence risks exist.	a) Balance of evidence indica-tes examples of non-permanence or b) significant non-permanence risks that are somewhat mitigated by methodology.	Balance of evidence suggests that permanence risks exist but are: a) minimal or b) effectively mitigated against by methodology. For example, the project has already accounted for land-tenure rights or set up channels for stakeholder consultations.	Evidence suggests that permanence risks are minimal.	Evidence indicates that permanence risks do not exist.
Policy/Political The degree to which activities impacting an offset project are supported or blocked by government policy or actions	No measures to verify policy risks and/or support have been under-taken or projects have failed to address risks.	Balance of evidence suggests that a) policy/political environment is highly supportive (e.g. measures are already legislated for) or that b) political insta-bility (including corruption, security of tenure, property rights etc.) presents a considerable risk to the project.	Balance of evidence suggests that a) policy/political environment is supportive; that b) political insta-bility (including corruption, security of tenure, property rights etc.) presents a moderate risk to the project; or c) that political instability presents a significant risk to the project, but that this is somewhat moderated by the methodology.	Balance of evidence suggests that a) policy/political environment may be supportive in some cases or b) political risks are effectively mitigated against by methodology.	Evidence suggests that a) policy/political environment has minimal influence on projects; b) that the policy environment is decidedly not supportive of the project type, or that c) risks from e.g. corruption/property rights regime etc. are minimal.	Evidence indicates that policy risks do not exist.

7.2

APPENDIX 1
Risk factor scoring bucket definitions

Risk Factor

Scoring Bucket

	0%	30%	50%	70%	90%	100%
Perverse Incentives The potential for benefits from a project, such as offset revenues, to incentivise behaviour that reduces the effectiveness of the offset.	No measures to verify presence of perverse incentives have been undertaken or projects have failed to address risks.	Balance of evidence suggests that of far-reaching perverse incentives that considerably impact the efficacy of a project.	Balance of evidence suggests that a) perverse incentives are likely or b) perverse incentives exist but are somewhat reduced by methodology.	Balance of evidence suggests that a) perverse incentives may be created by offsetting activity or that b) perverse incentives exist but are effectively mitigated against by methodology.	Evidence suggests that perverse incentive risks are minimal.	Evidence indicates that perverse incentive risks do not exist.

8   Appendix 02

APPENDIX 2
Modelling extreme
scenarios

In order to test the appropriateness of our risk factor scoring and weightings, BeZero looked at the potential 'extreme scenarios' of project scoring. This meant looking at hypothetical scenarios where a project scores highly in one area and poorly in all others, or vice versa, and assessing a) whether this was likely to occur from our scoring and b) whether the resulting rating reflected this range.

Scenario	Description	BeZero Carbon Rating	Risk Factor Coverage
Slightly Additional	In this instance, a project scores the lowest bucket for additionality but scores the highest bucket for the other five risk factors.	AA+	100%
Not Additional	In this instance, there is insufficient evidence to score additionality but the project scores the highest bucket for the other five risk factors.	AAA+	50% (minimum coverage not met and not considered for subsequent analyses)
Highly Additional	In this instance, a project scores the highest bucket for additionality but scores the lowest bucket for the other five risk factors.	AA+	100%
Only Additional	In this instance, a project scores the highest bucket for additionality but there is insufficient evidence to score the other five risk factors.	AAA+	50% (minimum coverage not met and not considered for subsequent analyses)

8.1   Appendix 02

APPENDIX 2
Modelling extreme
scenarios

For the two scenarios that do meet minimum risk factor coverage (80%), we examine the likelihood that such projects come to market or get recommended. From the 335 unique scores currently in the BeZero Carbon Ratings Framework, there are no occurrences of both of the above scenarios.

Project types that typically score lowest for additionality are avoidance methods that are cost-competitive or have significant other sources of revenue. For such projects to score the highest bucket in all other risk factors, they would likely have to be in sites with little to no policy support but effective property rights regimes. This contradiction presents an unlikely occurrence for a project. In addition, dropping the scores from the maximum for any one of the risk factors results in a project score below BeZero's internal investment grade of AA+.

Similarly, projects that typically score the highest bucket for additionality are nature based solutions in soil carbon or blue carbon sectors or technology based removal. Both of these project types have characteristically low policy coverage and therefore, do not meet the criteria required for the scenario. In addition, nature based projects are required to set aside varying risk buffers which would prevent permanence from receiving the lowest scoring bucket.

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