CARBONVERT

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Best Practices in Risk Management for the Demand Side in Voluntary Carbon Markets

A practical guide for Corporate Sustainability Leadership regarding carbon credit investments

Contents

INTRODUCTION

As companies develop an internal sustainability strategy, they face a complex set of risks associated with their investment choices, potentially reducing their net impact on the environment. These risks necessitate a robust due diligence process to ensure their investments have a material impact on the environment and don't open their business to both regulatory and public scrutiny.

For companies operating in the Voluntary Carbon Markets ("VCM"), these risks include the potential to greenwash the climate impact of their carbon credit purchases. Luckily, as the carbon markets have matured, industry stakeholders have developed risk management strategies to reduce risks associated with purchasing carbon credits.

This paper was written with the intent of educating corporate sustainability leaders, c-suite executives, and carbon credit project originators and investors on the risks present today in the voluntary carbon markets and how to best evaluate and address them.

Readers are assumed to have a basic understanding of the operating structure of the VCM, but for key terms, definitions have been provided. This guide is designed to provide an authoritative perspective on carbon credit purchase risk management, as this document reflects experiences and learnings drawn from professionals with over two decades of experience in the U.S. voluntary and compliance markets.

With that said, this paper takes the position that there are three discrete categories of carbon offsetting projects.

Removal Credits

Increasing the size of our nature and tech-based carbon sinks in order to remove more carbon from our atmosphere generates removal credits.

Nature-based reforestation projects and direct air capture projects both actively remove carbon that otherwise would have stayed in the atmosphere.

Assuming that there has been no recent deforestation, reforesting barren areas or stimulating an increase in carbon absorption will remove carbon that otherwise would have remained in the atmosphere.

Building Direct Air Capture facilities that actively scrub carbon from the air performs the same activity via a technology-based methodology.

Avoidance Credits

Protect existing carbon sinks and avoid activities that could lead to new emissions from new sources that do not currently exist.

Oceans and terrestrial plant life are the earth's largest carbon sinks. By protecting forests against deforestation or activity in the ocean that would reduce algal growth, carbon projects are avoiding adding CO_2 to the atmosphere that would have otherwise been absorbed and removed from the atmosphere.

Regarding technology-based projects, companies that commit to preventing planned operations that would have occurred are avoiding the hypothetical emissions that would have been released as a result of their future activity.

Abatement Credits

Removing actual emissions from a pre-existing source is an abatement, as less CO_2 is entering the atmosphere due to the project. If additional economic compensation from the carbon markets is the only way the reduction in emissions is economically viable, then the project is considered an abatement project.

Shifting industrial processes towards lower emissions such as transitioning from metal smelting using fossil fuel sources towards hydropower or similar would be an abatement project, as there were active, preexisting emissions from the process that are now being mitigated.

Worth noting, developing a greenfield project that uses lower emission processes, or captures the emissions in some way is also abatement, as there is an active change to design that occurs at an increased cost, which would be compensated via the sale of carbon offsets in the market.

Unlike avoidance offsets, abatement is a material removal of emissions that would have absolutely occurred, not emissions that might have been released.

REGARDING RISK IN THE VOLUNTARY MARKETS

Certain aspects of the risk evaluation assessments shared in this paper center on nature-based projects, given most public scrutiny has centered on carbon projects that utilize nature-based approaches, such as reforestation or avoided deforestation projects.

In this paper, we contrast “risk management,” which is the responsibility of a project investor or carbon credit purchaser, to “asset management,” which is typically the domain of a project owner to maintain the physical asset the credit is based upon and the associated contractual arrangements for the project. For our purposes, risk management covers the investor or purchaser’s responsibility to satisfy the internal business and external reporting requirements of senior business leaders, ESG reporting bodies, internal and external carbon accounting auditors, and regulators. The responsibility of the risk manager is to identify items that may lead to the environmental deterioration of an investment, and proactively work to resolve these situations. A key role of the risk manager is to “trust but verify” the results being presented to them.

Executive Summary

Risks to Buyers in the Voluntary Carbon Markets

The Voluntary carbon markets rely on the assumption that each carbon credit is truly representative of a ton of carbon. Carbon credits that can verify this assumption have "materiality". Materiality is considered the ability of a project to produce credits that have a high likelihood of removing, reducing (abatement), or avoiding a metric ton of CO2e from entering or staying in the atmosphere. Being able to determine if a project's carbon credits are material relies on understanding risks related to permanence, additionality, and leakage. Should one of these three pillars fail, the carbon credit purchaser will introduce major risk into their sustainability program.

FUNDAMENTALS OF CARBON CREDIT RISK

- **Permanence**
- **Additionality**
- **Leakage**

Evaluation Techniques and Resources to Assess Risk

Carbon projects will have different levels of associated risk. This variation is the result of many variables, such as differing standard practices across registries and continual advancement in measurement techniques. Prior to purchase, credit buyers can evaluate the level of risk they may be introducing into their sustainability efforts in 3 core ways:

1. Rigorous evaluation of the project design documentation and the project methodology being used
2. Independent collection of verification data, such as publicly available satellite imagery
3. Utilize 3rd Party Ratings Data to inform procurement strategies

Valuation of Carbon Credits Based on the Risk Assessment

Regarding the three fundamentals of credit risk, permanence, additionality, and leakage, project investors and credit buyers should determine if the credit meets their threshold to be considered material, and if there is additional value created from the project due to its longevity. Once the carbon value has been determined, buyers should assess their willingness to pay for the project's associated co-benefits.

Best Practices to Mitigate Risk During Negotiations and After Purchase

After evaluating the risks associated with a given project and deciding to purchase credits, a buyer can implement certain practices during contract negotiation and after purchasing credits to further mitigate concerns to its longevity. Once the carbon value has been determined, buyers should assess their willingness to pay for the project's associated co-benefits.

- Work with reputable project developers.
- Diversify the overall portfolio of carbon credits.
- Consider paying for a carbon insurance program to protect against loss of credits.
- Ensure that the contract lists the seller or project owner as responsible for covering any loss of credits due to leakage, permanence, or additionality.
- Ensure that the contract is enforceable for the lifetime of the project.
- Separate spending on environmental issues from spending on social issues.
- Work with the seller to quantify any co-benefits associated with the project.

Risk Management Checklist

Risk Evaluation and Materiality Assessment

Review Project Design and Governing Body Project Methodology

- Evaluate Baseline Assumptions
- Confirm Buffer Pool Size
- Identify and Quantify Co-Benefits
- Evaluate Permanence Risks
- Evaluate Additionality Risks
- Evaluate Leakage Risks

Assess Independent Data

(e.g. Geospatial information to assess forestry projects)

- Evaluate Permanence Risks
  - Sentinel 3 SLSTR land surface temperature data
  - Sentinel 2 Normalized Difference Moisture Index (NDMI) data
- Evaluate Leakage and Additionality Risks
  - Sentinel 2 Normalized Difference Vegetation Index (NDVI) data
  - Planet NICFI Triangular Greenness Index (TGI) data
  - Planet NICFI Localized Visible Atmospherically Resistant Index (VARI) data
- Cross Verify against 3rd Party Credit Ratings
  - Verify carbon project on credit materiality
  - Assess Co-benefit impact

Contract Negotiation Priorities

- The seller or project owner is responsible for covering loss of credits due to leakage, permanence, or additionality.
- In the case of credit loss beyond the coverage from a buffer pool and insurance, the seller or project owner must provide compensation either in the form of credits from an equivalent project, or repayment equivalent to the purchase value of the credits.
- In the case a project developer receives approval to sell credits from a project's buffer pool, adequate insurance is in place to cover the risk of loss.
- Ensure that the contract is enforceable for the lifetime of the project.

Ongoing Risk Mitigation Steps

- Further diversify portfolio of carbon credits over time
- Implement a carbon insurance program
- Develop partnerships with reputable project developers.
- Disclose conservative estimated volumes of carbon instead of volumes calculated under the registry's methodology.

SECTION 1

Carbon Project Risks Permanence, Additionality, & Leakage

The value of carbon credits can vary wildly based on the registry body, methodology, and additional credit co-benefits, despite the underlying credit is the same. Each credit represents a ton of CO2e that is not present in the atmosphere but would be if no action was taken. The assumption that the credit is truly representative of a ton of carbon relies on understanding the project risks across the three key areas of permanence, additionality, and leakage, outlined below. Should one of these three pillars fail the project investor or carbon credit purchaser is introducing major risk into their sustainability program.

After outlining the risks associated with the base credit, this paper will provide a framework with which risk managers can price the base value of the credits generated from a carbon project. With this base price identified, readers can decide how much they value the additional, qualitative co-benefits.

01
CARBON CREDIT

=

01
TON OF CO2e

Permanence

Permanence is the consideration for how long the carbon dioxide removed, abated, or avoided will be kept out of the atmosphere. Specifically, when credits are evaluated based on permanence, a buyer should understand the degree of confidence the project owner and developer have that the project will keep the carbon out of the atmosphere for a given period of time. According to the Intergovernmental Panel on Climate Change (“IPCC”) carbon dioxide released today has an atmospheric lifetime of 5 to 200 years. As of 2023, the best nature-based and technology-based carbon offset projects have a high degree of confidence that the carbon they remove, abate, or avoid will remain out of the atmosphere for at least 100 years.

EXAMPLE OF RISK

In 2022 CarbonPlan, a San Francisco-based non-profit that researches the integrity of programs designed to offset carbon emissions, released a paper looking at the impact that wildfire's have had on California's Carbon Offsetting Program (Badgley et al., 2022). Under the California Air Resources Board ("CARB") carbon offsetting program, companies operating in California can trade and retire credits resulting from carbon stored in forests across the continental United States and parts of coastal Alaska.

CarbonPlan found that despite the forestry program's 100-year guarantee on forest carbon claims, the buffer pool will not cover the current impact of wildfires and deforestation. A buffer pool is a percentage of a given project's credits that are held by the project developer as a safeguard against the risk of loss of offsets due to unforeseen circumstances. In the case of a wildfire, the offsets would be retired to ensure that the credits that have been issued and sold to buyers still provide a carbon benefit. As of 2022, wildfires have depleted nearly one-fifth of the total CARB forestry program buffer pool in less than a decade, equivalent to at least 95 percent of the program-wide contribution intended to manage all fire risks for 100 years.

Buyers of credits in voluntary markets face the same risk identified above, and oftentimes the buffer pool that project owners create is smaller than that created under CARB. Additionally, many nature-based projects in the voluntary market only have an anticipated lifespan of 30 years, meaning that the MRV programs that verify permanence will not be continued for 70% of the time required for a project to claim permanence.

Additionality

Additionality is the requirement that the GHG emissions after the implementation of a carbon credit project are lower than those that would have occurred in the most plausible alternative scenario to the implementation of the project. Put simply, a project can claim additionality if it can credibly demonstrate that emissions within the project boundary are lower than would have occurred if no investment or direct action was taken.

EXAMPLE OF RISK

In 2020, Bloomberg Green released an expose of projects developed and owned by The Nature Conservancy, claiming that these projects were counting carbon dioxide savings from existing trees that weren't endangered. The report found that "Per Bloomberg Green, in one of their projects, less than 1% of trees were cut a year. In other forests involved in these projects, no trees were cut at all." (Elgin, 2020). As a result, JPMorgan, Disney, Blackrock, all buyers of The Nature Conservancy's credits, faced criticism for investing in a project that did not meet basic requirements for additionality, as those trees did not face risk of deforestation in the first place.

Leakage

Leakage refers to an unintended increase in greenhouse gas emissions or the shifting of emissions from one place to another due to a carbon credit project. Leakage occurs due to shifting demand from a protected region within the project boundary to an unprotected region, resulting in no net reduction in emissions. As an important distinction, increased logging or operational activity around the project boundary is not immediately indicative of leakage, as some level of continued deforestation should be anticipated. Deforestation or other continued or increased levels of negative climate impact are indicators that the concerns that led to the project being developed are true. If the landowners that commit to reforestation efforts or protection against deforestation instead increase logging elsewhere on their property that isn't protected, then the project does have leakage.

EXAMPLE OF RISK

In late 2022, researchers at the University of California, Irvine utilized satellite data tracking the levels of carbon and logging activity within California's 37 offset project sites (Coffield, et al., 2022). Through their investigation, the researchers found that in some regions, projects are being put on lands with lower-value tree species that aren't at risk from logging. For example, at one large timber company in the redwood forests of northwestern California, the offset project is only 4% redwood, compared with 25% redwood on the rest of the company's property. Instead, the offset project's area is made up primarily of tanoak, which is not marketable timber and doesn't need to be protected from logging.

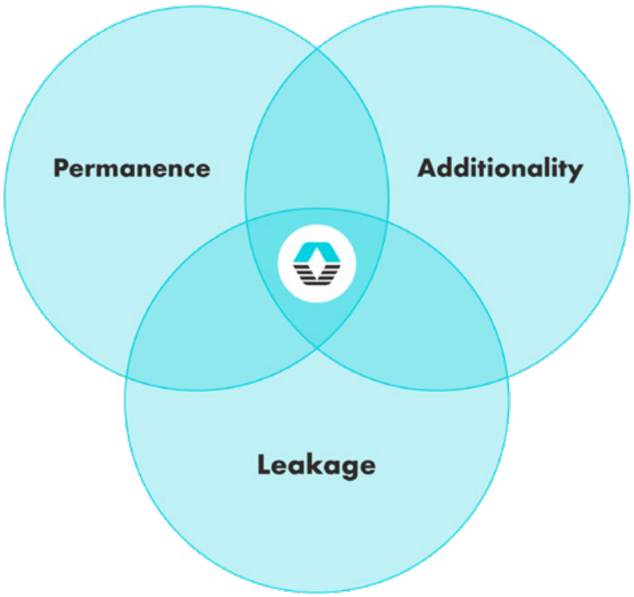
In addition to these concerns, the projects face scrutiny regarding logging activity within the project boundary. In their paper, researchers found that harvesting rates across Northern CA have remained fairly constant, with no indication of harvest reductions in offset projects. In fact, they observed a slight increase in the harvest on large timber company-owned offset projects and their surroundings from the project start date continued for 70% of the time required for a project to claim permanence.

SECTION 2

Evaluating Project Risk & Determining Credit Value

Carbon projects will have varied levels of materiality, which is essentially the amount of credibility a given project has when under scrutiny. For this paper, materiality is considered the ability of a project to produce credits that have a high likelihood of removing, reducing (abatement), or avoiding a metric ton of CO2e from entering or staying in the atmosphere. Materiality also touches on co-benefits, as a buyer should be able to quantify the positive external benefit of a given project, such as being able to list the number of local staff hired, revenue from the project that stays in the community, or the number of people that are anticipated to have better access to high quality water are a result of the project.

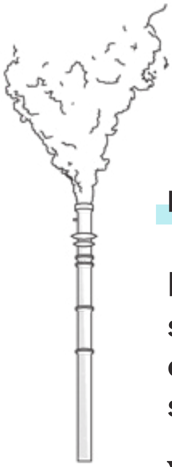
Below are a few ways that risk managers can evaluate the risks carbon projects face that would harm the materiality of a carbon credit. Based on a buyer's assessment of risk, we then propose a framework to determine willingness to pay.



Materiality is considered the ability of a project to produce credits that have a high likelihood of removing, reducing (abatement), or avoiding a metric ton of CO2e from entering or staying in the atmosphere.

Evaluating the Materiality of a Carbon Credit based on Project Design and Methodology

Major registries provide project design documents to the public to review. Within the design documents, a risk manager can vet a project based on their disclosed baseline assumptions and general project design. Below are a few core areas of the documentation that should be evaluated to determine materiality.



Baseline Assumptions

Project designs will include a baseline scenario outlining the likeliest situation should business have continued as usual. If the situation is unrealistic, or local data from outside the project boundary/operations does not reflect the baseline scenario, then any given estimates about the CO2 benefit are not viable.

Within the project design documentation, the developer will list the methodology being used to issue the credits. Each methodology has a model with given inputs to estimate the total CO2e that a project will prevent. Certain methodologies have faced scrutiny recently due to outdated measurement techniques and assumptions that have led to over-issuance of carbon credits.

Risk managers should review the methodology documentation, including any efforts to update baseline assumptions, as well as review the baseline calculations performed by the project developer to see if any deviations from the methodology have been performed.

Buffer Pool

Within the assessment documentation, there should be a breakdown of the calculated annual issuance of carbon credits based on the baseline scenario.

These assessments should include data on the annual number of credits that are withheld by the project owner to act as their contribution to the buffer pool. From experience, many projects hold around 10% of their annual credit issuance in their buffer pool to protect against the risk of loss.

Risk managers should weigh the size of the buffer pool against the accuracy of the baseline, as the most likely cause of loss that would exceed the size of the buffer pool is over-issuance of credits due to inaccurate baseline estimates.

Co-Benefits

Many carbon projects also have associated UN SDGs, and other co-benefits, which do not go away even if a project does not have as large of a CO_2 impact as initially claimed.

Buyers should review the registration documents and work with the project developer to quantify the co-benefits in order to highlight those as well.

> **i.e.** determine the verified number of people with better access to drinking water or derive the actual dollar value of the economic benefit to the local community

Co-benefits can act as a vanguard against traditional project risk, since these benefits are independent of the CO_2 value of the carbon credit. Once a risk manager quantifies the co-benefits, they can highlight those independently of their GHG offsetting efforts in their sustainability disclosures.

Permanence

For many nature-based offsets, community engagement is imperative, as hiring of staff and local monitoring efforts begin with the local populace. Projects with robust community engagement initiatives, as well as outlined hiring plans for local stakeholders is a qualitative means to understand how well a given project is designed.

If a project lacks effective community engagement or other means to guarantee ongoing monitoring and maintenance, it will be difficult for a project developer to back their claims regarding permanence

Additionality

As mentioned above regarding baseline assumptions, the baseline scenario determines the additionality of a given project. If the baseline is unrealistic and not occurring outside the boundaries or operations of the project, then there is no additionality.

Developers can only prove additionality if the project would not be economically viable without additional compensation from the sale of the carbon credits. In best-in-class projects, the documentation should provide a breakdown of the cost estimates of the given project, as well as the registry's assessment methodology for determining additionality.

Another key aspect in verifying the additionality of a project is confirming that there is no planned regulatory action that would have necessitated the project occur, which would nullify the additionality of the credits after the regulation is put into action.

As identified in example above related to project additionality risk, developers must clearly state the present risk that is being mitigated due to the project. For forestry projects, buyers should review the documentation to confirm that the project is either located in a forest that has existed for a certain period of time (minimum of 10 years), and that there has been an ongoing risk of deforestation, or that the reforestation effort is not on a preexisting deforestation project location, and that reforestation will provide a stronger economic and climate benefit than other potential uses of the land.

Leakage

Similar to permanence, local stakeholders are typically the ones that can prevent or enable leakage. If additional deforestation or increased operations occurs outside the project boundary as a result of the project, it is typically due to a lack of engagement with the public. Developers will usually provide maps and other resources outlining the leakage management area, or related area that is at risk of leakage.

Certain AFOLU projects, especially avoided planned/unplanned deforestation projects, take place on private landowner's acreage. Buyers should review documentation to see if the project encapsulates the entire landowner's acreage, or if there is other land that the owner may instead prioritize for deforestation.

Evaluating the Materiality of a Carbon Credit Using Geospatial Data

Should the buyer have enough internal technical expertise, publicly available satellite data can provide insight into both project efficacy and project risk for nature-based projects. The sources below can be utilized at no or low cost and will provide objective data on the project's level of performance.

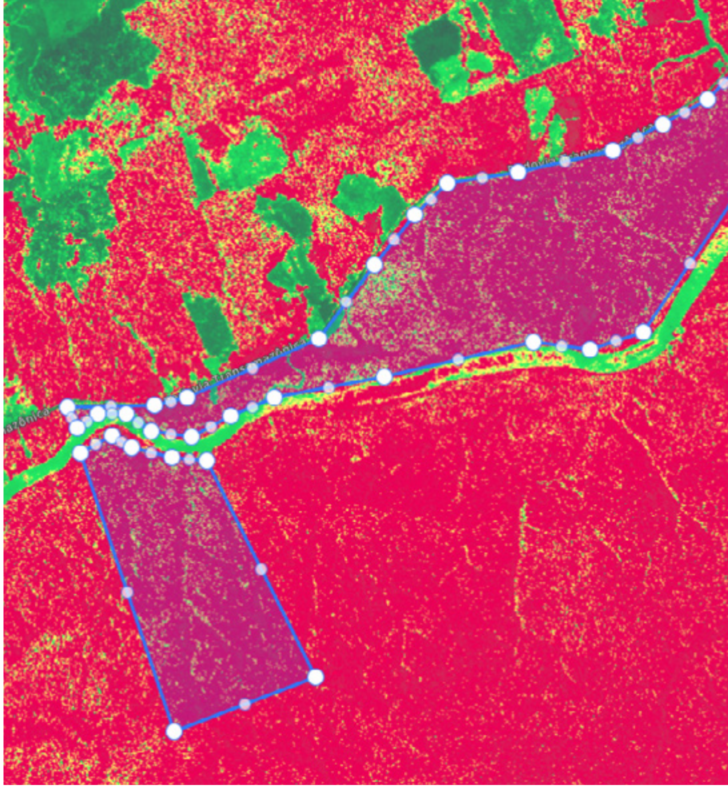


Figure 1: Satellite imagery, The São Damião and Boa Lembrança properties (see full source on pg. 40)

European Space Agency Data

Sentinel 2: Provides high-resolution images in the visible and infrared wavelengths, to monitor vegetation, soil and water cover, inland waterways and coastal areas.

Normalized Difference Vegetation Index (NDVI)

NDVI is a measure of the state of vegetation health based on how plants reflect light at certain wavelengths. The value range of the NDVI is -1 to 1. Negative values of NDVI (values approaching -1) correspond to water. Values close to zero (-0.1to 0.1) generally correspond to barren areas of rock, sand, or snow. Low, positive values represent shrub and grassland (approximately 0.2 to 0.4), while high values indicate temperate and tropical rainforests (values approaching 1).

Normalized Difference Moisture Index (NDMI)

NDMI is used to determine vegetation water content and monitor droughts. The value range of the NDMI is -1 to 1. Negative values of NDMI (values approaching -1) correspond to barren soil. Values around zero (-0.2 to 0.4) generally correspond to water stress. High, positive values represent high canopy without water stress (approximately 0.4 to 1).

Water content and its change over time is an indicator of wildfire risk and should be evaluated to understand the risk of loss due to external factors that are not competently covered in the design documents.

Sentinel 3 SLSTR: The Sea and Land Surface Temperature (SLSTR) instrument on board Sentinel-3 measures the global and regional sea and land surface temperature.

F1 and F2 Brightness Temperature Data (LST)

The Sentinel-3 Sea SLSTR has two dedicated channels (F1 and F2) that aim to detect Land Surface Temperature (LST). It is very useful for fire and high temperature event monitoring at 1 km resolution.

Should the buyer have capacity to monitor their projects, LST data can inform them in the case of wildfires within the project boundary.

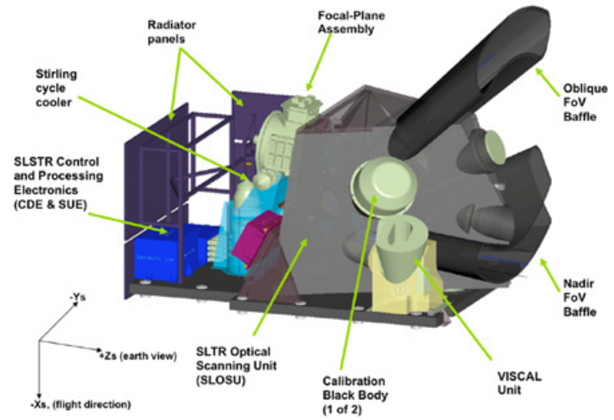
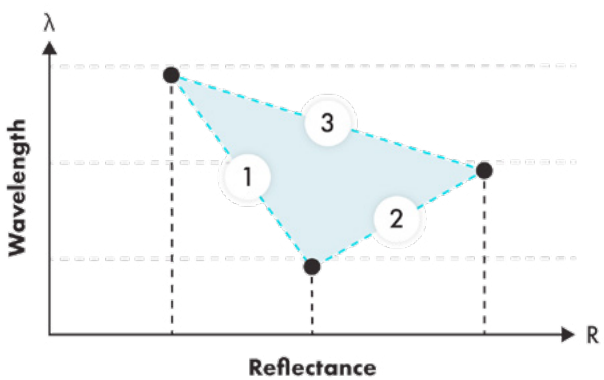


Figure 2: The Sea and Land Surgace Temperature (SLSTR) instrument, Sentinel Online (see full source on pg. 40)



Planet NICFI Publicly Available Data

Norway's International Climate & Forests Initiative (NICFI) provides access to Planet's high-resolution, analysis-ready mosaics of the world's tropics.

Figure 3: Triangular Greeness Index (VARI), ResearchGate (see full source on pg. 40)

Triangular Greenness Index (VARI)

The TGI is highly correlated with leaf chlorophyll content. TGI values are positive when the green reflectance is greater than between red and blue wavelengths. This corresponds to green vegetation.

GI is an optical means to understand vegetation in order to understand whether deforestation or reforestation efforts have been successful within a given project boundary.

Localized Visible Atmospherically Resistant Index (VARI)

This index is based on the ARVI and is used to estimate the fraction of vegetation in a scene with low sensitivity to atmospheric effects.

Unlike TGI, VARI provides a means to view ground vegetation in situations when cloud cover is high. In tropical or coastal regions, VARI may provide better optical data on the level of vegetation within a given project boundary.


Acre
Rio Branco
Cobija
Pando
Cusco
La Paz
San Borja
Juliaca

Through independent data like the sources shown, buyers will be able to get an understanding of project permanence due to its vulnerability to wildfires and other climactic conditions.

Buyers will be able to vet for additionality and leakage by reviewing recent vegetation growth data and comparing it against conditions prior to the credit issuance period. Ultimately, a buyer will need to develop their own risk matrix to determine how they define low, medium, and high risk projects, but this information can serve as metrics to determine whether a project meets their threshold for acceptable risk.

Figure 4: Planet NiCFi SkySat basemap dataset, Sentinel Hub (see full source on pg. 40)

Evaluating the Materiality of a Carbon Credit Using 3rd Party Ratings Data

Many sustainability professionals are tasked with executing internal GHG emission reduction initiatives and developing an offsetting strategy. As such, an in-depth background on voluntary carbon market standards, methodologies, and independent data sources may not fit within their preexisting area of expertise. For managers that don't have the capacity to review the documentation or verification data themselves, independent 3rd party ratings organizations have cropped up to offer their evaluations of project materiality and overall value. Below are a few ratings organizations that may serve as project vetting partners.

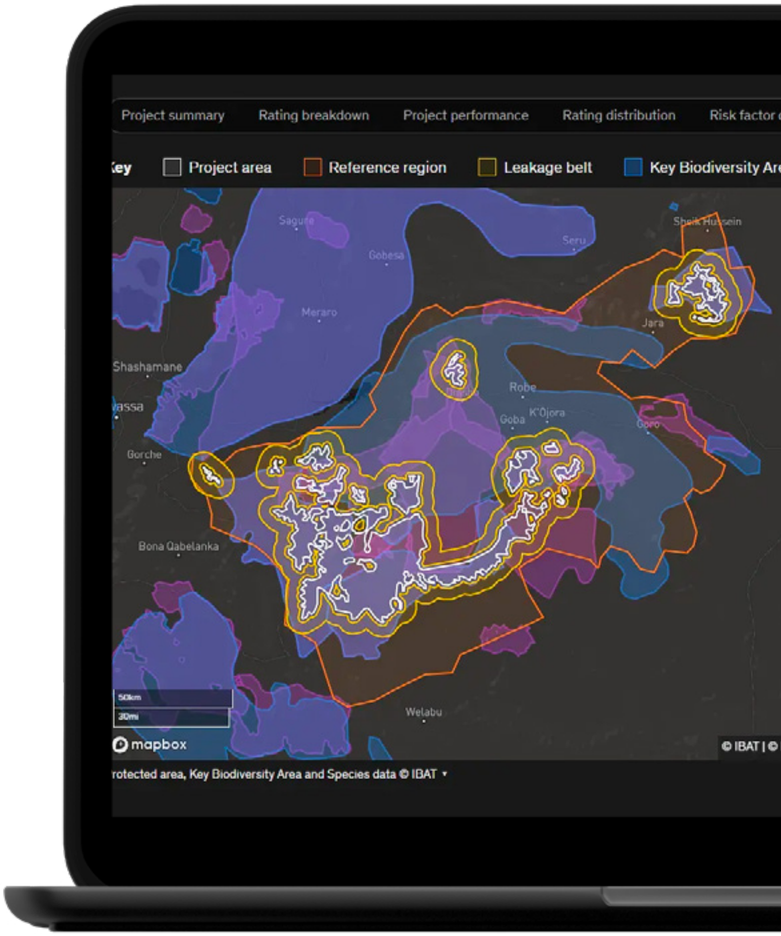


Figure 5: BeZero Carbon Platform (see full source on pg. 40)

BeZero

The BeZero Carbon Rating (BCR) of voluntary carbon credits represents BeZero Carbon's current opinion on the likelihood that a given credit achieves a tonne of CO_2e avoided, abated, or removed.

BeZero's approach covers both nature-based, and technology-based projects and focuses on project design and methodology efficacy. Their current ratings account for nearly half of all credits available today on the voluntary carbon market.

The BeZero Carbon Rating uses an eight-point scale ranging from "highest likelihood" (AAA score) to "lowest likelihood" (D score).

If BeZero is selected, it is recommended to only consider projects that have a BeZero rating of "BB" or higher, as any project below that threshold has a low likelihood of achieving 1 metric ton of CO_2 avoidance or removal.

Sylvera

Sylvera rates reducing deforestation and forest degradation (REDD+), afforestation, reforestation and revegetation (ARR), improved forest management (IFM), and renewable energy source (RES) projects.

Sylvera's ratings uses remote sensing data from satellites and drone equipped with Light Detection and Ranging tech ("LiDAR") to run models that estimate the carbon avoided, abate, or removed from a project, and then compares their measured value against the calculated value in the project design documents.

The Sylvera rating is measured on a scale from highly likely to have delivered on its claims, AAA, to least likely to have delivered on its claims, D.

Outside of the rating, Sylvera performs an assessment of the biodiversity and community co-benefits of projects.

Calyx Global

Calyx provides both GHG Risk Ratings and United Nations SDG Impact Ratings. Their GHG rating assesses the risk that carbon credits do not meet their claims of reducing or removing the equivalent of one metric ton of CO2.

Their GHG risk rating includes a screening of the credit issuing body, evaluation of the project methodology and protocols, as well as a project-level evaluation.

The United Nations Sustainable Development Goals Impact rating only evaluates co-benefit impact from projects that are part of a recognized SDG certification. Their assessment focuses on whether the SDG claims have a clear link between project activities and resulting outcomes, and the scale of the resulting outcome.

RENOSTER

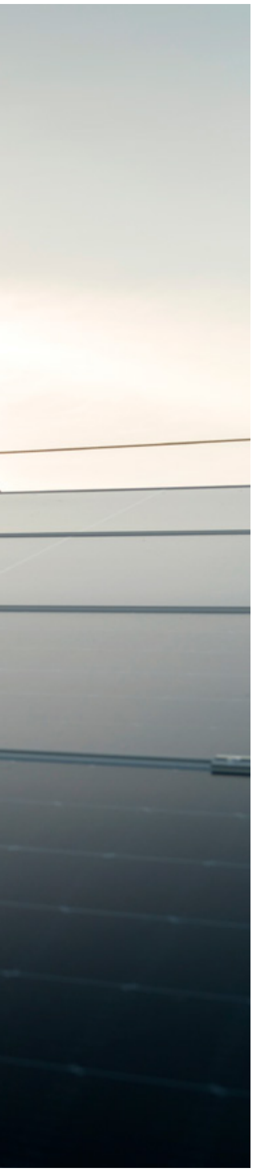
Renoster is a nature-based carbon credit rating company. Their approach rates projects based on five principles: Additionality, Baseline, Leakage, Verification, and Permanence. All five core areas are evaluated to determine the material benefit of a carbon credit and do not consider the co-benefits of a project.

Renoster's approach to ratings focuses on remote sensing techniques, predominantly geospatial data from satellites.

In addition to evaluating baseline estimates against their data, Renoster also utilizes geospatial information to inform the likelihood of risk that the carbon is emitted back into the atmosphere due to climactic changes and encroaching deforestation.

Determining Base Value or Willingness to Pay for a Credit After Evaluating Fundamental Risk

Regarding the three fundamentals of credit risk, permanence, additionality, and leakage, project investors and credit buyers can consider additionality and leakage as discrete, binary indicators of the value of a credit, while permanence acts as a continuous indicator of credit value. Each of these three categories impacts the materiality of carbon credits, and whether the credits have any inherent value related to carbon offsetting. When performing due diligence, it is important that the seller or original project developer is asked to cover the obligation of loss. Coverage should extend beyond the buffer pool and include additional credit purchases to cover any potential loss experienced by the buyer.



If a project lacks additionality or has leakage, then it is difficult to credibly claim the offset emissions. If a risk manager cannot adequately address concerns regarding either additionality or leakage, the base Willingness to Pay ("WTP") of the credit should sit at $0.

As an important note, this does not mean that the project or credit is useless, just that the credit should not be purchased as a tool to offset emissions. The credit may still have inherent value due to any co-benefits and alignment with UN SDGs.

After evaluating project additionality and leakage, permanence should act as a more continuous indicator of a buyer's WTP. The market has set 100 years as the threshold for a credit to have permanence. The buyer's review of the contracted duration of MRV operations, project maintenance and staffing, and data on the risk of loss due to climactic conditions will indicate whether the project can reasonably provide a 100+ year guarantee. With that in mind, any project where the carbon will be sequestered for a period shorter or longer than that time frame should influence the base credit value.

THRESHOLD OF CREDIT PERMANENCE = 100 YEARS

Projects that have a 30-year time horizon may still have a 100-year benefit if the buffer pool is large enough to cover the potential for loss due to deforestation, fires, climactic events, disease, and insects. A review of regional data can determine the risk threshold a credit buyer should adopt regarding the size of the buffer pool.

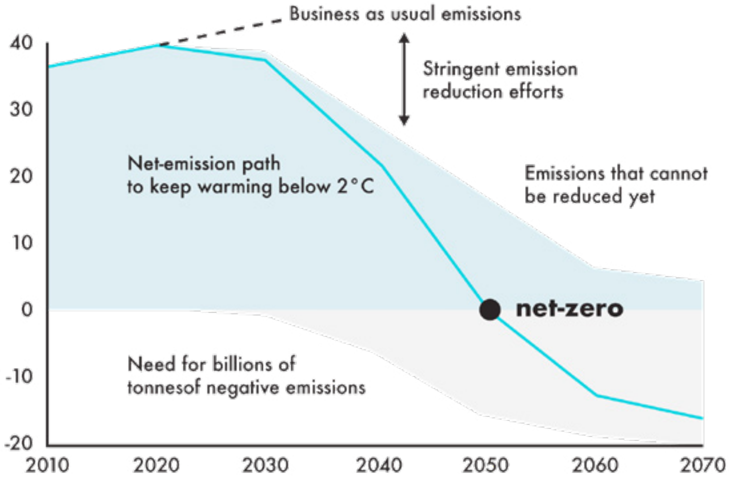


Figure 6: The risk of CO2 leakage decreases with time after injection, Übermorgen (see full source on pg. 40)

Projects with permanence controls in place to sequester carbon beyond the threshold may demand a higher price due to the materiality guarantees their methodology provides. Once a buyer has determined the value they are willing to pay for the base carbon credit, they can determine the premium they are willing to pay for the co-benefits associated with their purchase of carbon credits.

SECTION 3

Best Practices to Mitigate Risk

Arguably the most important role of a risk management professional regarding carbon credits is to measure and communicate risk factors to others within their organization. After evaluating the risks associated with a given project and determining the internal willingness to pay, a buyer can implement certain practices during contract negotiation and after purchasing credits to further mitigate concerns.

> **…the most important role of a risk management professional regarding carbon credits is to measure and communicate risk factors to others within their organization**

US forest risks due to Fire, Drought, and Insects in the year 2050

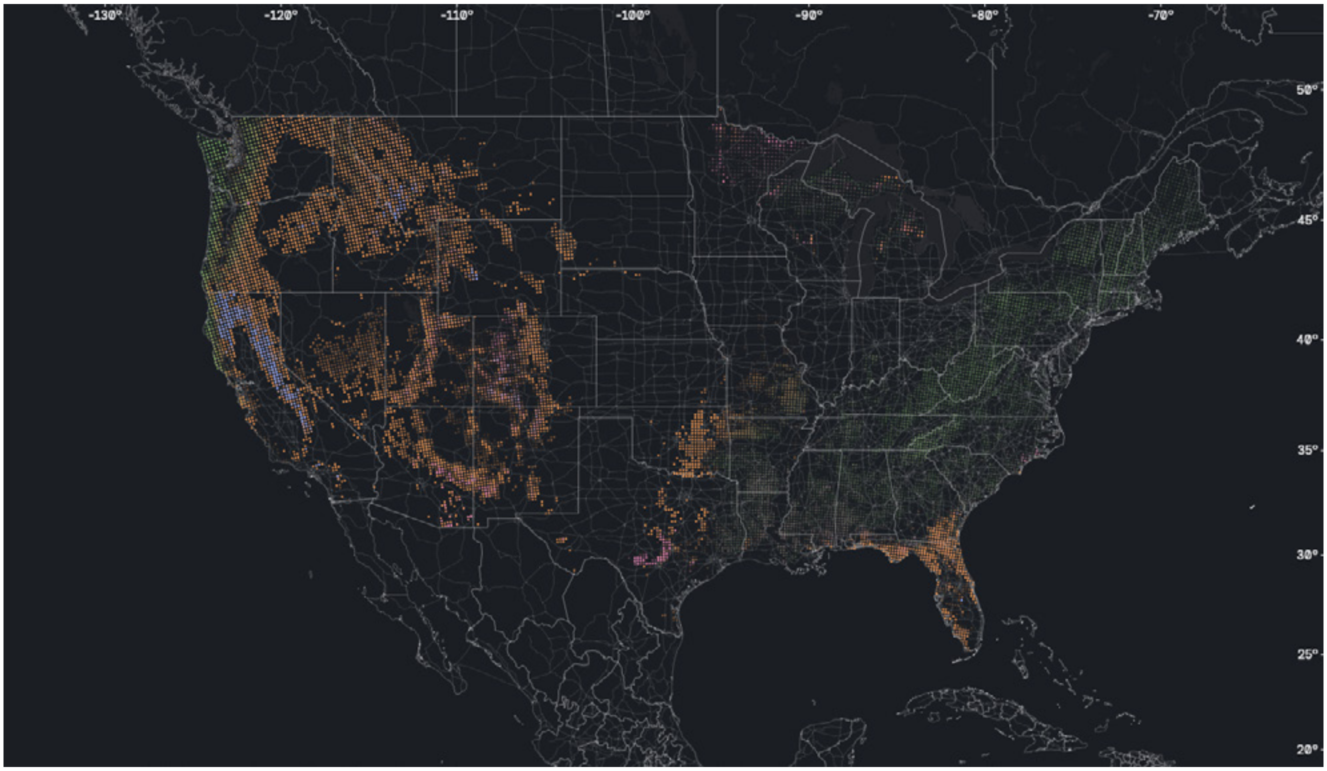


Figure 6: Projections of risks to US forest carbon under a changing climate, (Carbon)plan (see full source on pg. 40)

Operational Risk Mitigation

For project developers, projected credit value drives their financial model, in turn determining the size of their buffer pool and spending on operational upkeep. Developers rely on revenue from the sale of their carbon credits, and inherently have an incentive to reduce their buffer pool to increase potential revenue. If project operations begin to break down, or credits are lost due to climactic conditions or regulatory changes, buyers may face public scrutiny. As a buyer, you can control your exposure to your developer’s operational risks in a few ways:

Diversify your portfolio of carbon credits

Technology-based projects are focused on removal or abatement of emissions, and their methodologies typically have an inherently stronger permanence guarantee. As an example, Direct Air Capture and Carbon Capture Projects both use geologic storage to sequester the removed and abated carbon. In a 2023 report commissioned by the UK Department for Business, Energy & Industrial Strategy (BEIS), 99.9% of geologically stored carbon is anticipated to stay confined zin the storage site over a 100-year period (Daniels et al. 2023).

In another study published in the scientific journal Nature in 2018, researchers estimated that realistically well-regulated storage have a 50% probability that leakage remains below 0.0008% per year, with over 98% of the injected CO2 retained in the subsurface over 10,000 years (Alcalde et al., 2018).

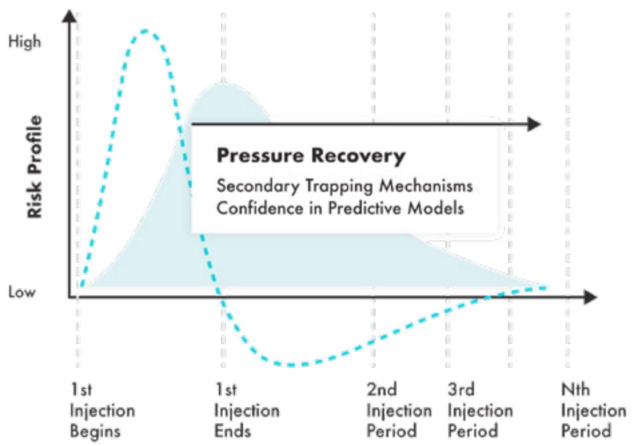


Figure 7: Pressure recovery of stored carbon, Pickering Engergy Partners (see full source on pg. 40)

Buyers may also opt to pay for their own carbon insurance program to protect against the risk of a seller failing to provide compensation for loss of credits.

Covering delivery risk and historical offsets is a means to transfer risk and focus offsetting budgets on developing a comprehensive offsetting portfolio.

Kita

Kita Earth is an insurance company that safeguards the quality and performance of carbon purchases by protecting buyers of forward purchased carbon removal credits against under-delivery. They are also developing additional products to cover existing procured volumes.

Work with reputable project developers that have the scale to deliver on their contractual obligations.

Contractual Risk

When a buyer purchases carbon credits, they are purchasing the right to claim the offset emissions and the co-benefits associated with the project. They are not, in most cases, taking on the obligation to cover the risk associated with that credit should there be an issue with the project. Purchase Agreements or Master Service Agreements typically stipulate the responsibilities of each party. As a buyer, responsible risk managers will make sure the Purchase Agreement or the Master Services Agreement explicitly includes the below:

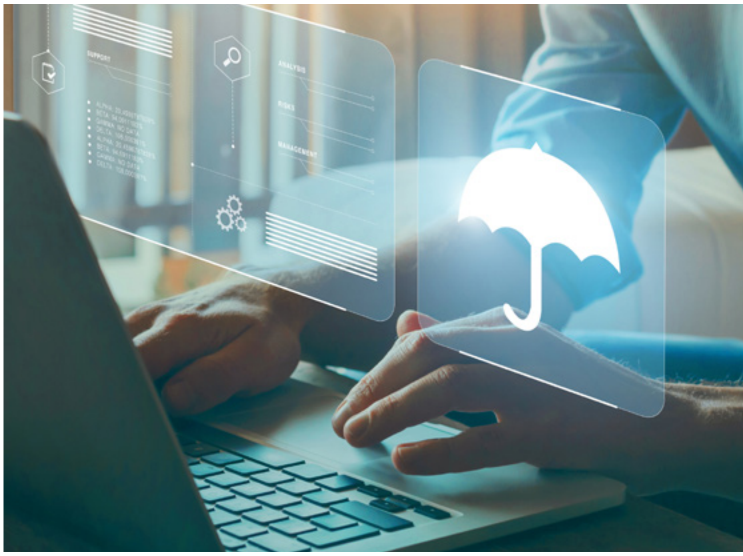
The seller or project owner is responsible for covering any loss of credits due to leakage, permanence, or additionality.

The seller will cover any loss by creating a buffer pool and retaining project insurance for the lifetime of the project.

In the case of credit loss beyond the coverage from a buffer pool and insurance, the seller or project owner must provide compensation either in the form of credits from an equivalent project, or repayment equivalent to the purchase value of the credits.

Ensure that the contract is enforceable for the lifetime the project.

In the case a project developer receives approval to sell credits from a projects buffer pool, adequate insurance is in place to cover the risk of loss.



Methodology Risk

When a methodology is shown to have over-issued credits due to new data, all parties in the market face a large credibility risk and public scrutiny. As the governing bodies of the VCM, public registries develop the underlying methodologies for carbon credit projects. These organizations are expected to have the necessary knowledge base and skillset to create protocols that will accurately issue credits to projects. However, methodologies need to be updated as new technologies become available. Many registries only update methodologies every 3-5 years, leading to a gap between new data creating more accurate project volumes and out of date predicted volumes from an old methodology.

Buyers can mitigate the risk that their credits come from an old methodology that may be shown in the future to have been inaccurate:

Work with a 3rd party rating agency to understand the quality of a project and consider using their estimated volumes of carbon instead of the volumes calculated by the registry.

Most independent ratings use new technologies that model the carbon impact of a project better than the calculations in existing methodologies.

Design an offset program focused on novel technologies and offsetting means.

Many organizations, typically in the technology sector, are avoiding methodology risk by investing in projects that use new carbon capture/abatement technology or new project types have no existing methodology. As a result, they focus on the future value of their investment by claiming their capital reduces future costs to bring technology to market.

Public Perception Risk

Given the voluntary nature of the VCM, many of the risks a buyer faces boil down to negative public scrutiny. However, a poor public image can have significant financial consequences for any company or organization. Companies with poor sustainability initiatives face a negative impact on their brand value, stock price, and access to capital.

While renewable energy credits and nature-based credits make up around the same volume of credits available in the VCM, nature-based credits account for nearly 80% of the value in the market. The outsized value of AFOLU credits is due to a company's ability to use them for marketing efforts in addition to their sustainability goals. This works well until a problem occurs. At that point, public marketing and outreach built around their offsetting strategy turn into liabilities. To best address the risk of public scrutiny, companies have two options:

Separate spending on environmental issues from spending on social issues

Companies may avoid public scrutiny regarding offsetting claims by prioritizing projects that have more rigorous controls on credit materiality, such as geological Carbon Storage, reduced emissions from industrial processes, biogas and biofuels, and others.

These projects are typically designed around metered systems that can measure the abated or captured emissions with higher accuracy, and as a result are better able to demonstrate materiality.

These credits tend to be less expensive, since they often don't come with co-benefits. The cost savings on credits could then be put towards specific company-aligned charitable giving.

Work with the seller to quantify the co-benefits a project provides

When a project loses its credibility surrounding emissions, it does not lose the positive co-benefit impact. Once quantified, the social value of a credit is no longer reliant on the claimed CO2 avoided, abated, or removed.

As an example, if a business that purchased 100 carbon credits can demonstrate their credits also led to an increase of 20% in median income for the community located adjacent to the project, that improvement in local economic development is no longer ambiguous, and isn't tied to the credit being viable.

CONCLUSION

Shift from BUYER BEWARE to BUYER BE AWARE

The Carbonvert team hopes this guide provides a comprehensive overview of the uncertainties, risks, and mitigation techniques that are present in the voluntary carbon markets. Sustainability leaders must decide whether their team has the time and budget to implement a responsible risk management and MRV program. In addition, credit buyers should be aware of the potential costs and time requirements arising from an offsetting program, including additional fees from rating agencies, insurance providers, and independent auditing firms.

Should these costs become too high, buyers have two additional options. Either outsource the risk management strategy to a trusted partner/broker or look upstream and invest in projects with developers for direct input on project design and management.

Should you need help finding project investment opportunities or developing your internal risk management strategy, Carbonvert is ready to support your company.

Definitions

Carbon Credits

A carbon offset (or voluntary carbon credit) is an environmental certificate that represents one ton of CO_2 or equivalent greenhouse gas (CO_2e) that is not in the atmosphere. These credits can be generated either by removing existing carbon or CO_2e from the atmosphere, proactively reducing emissions from existing sources, or avoiding increases in emissions by limiting future activity. These three methods are respectively called removal, abatement, and avoidance.

Co-Benefits

Co-Benefits are the less tangible positive impacts that the local community and project region receive as a result of a carbon project. These benefits range across areas such as biodiversity protection, pollution reduction, local economic growth, and cultural heritage support. Many of these co-benefits are categorized within the United Nations Sustainable Development Goals to show international alignment.

Greenwashing

Greenwashing is the process of conveying a false impression or misleading information about how environmentally sound a company's products or services are.

Internal Cost of Carbon

The internal cost of carbon is the monetary value a company places on each ton of their carbon emissions, which is readily understandable throughout the organization. For many companies, this price creates a dedicated revenue or investment stream that can be used to fund the company's emissions reduction efforts. According to the Carbon Disclosure Project ("CDP"), a global non-profit that runs the world's environmental disclosure system for companies, cities, and investors with over $110 trillion in assets, nearly half of the world's biggest companies have set a cost of carbon. CDP data has the average internal cost of carbon sitting at around $25 per metric ton (Bartlett, 2021).

Monitoring, Reporting, & Verifying

Monitoring, Reporting, and Verifying (MRV) is a key step in the development and operation of a project that generates carbon credits. MRV includes developing a program that outlines the process by which the project owner will verify the climate benefit of the issued carbon credits throughout the lifetime of a project. Typically, the MRV program is either run internally by the project owner or outsourced to an external consultancy with skillsets tailored to verifying projects under a specific methodology. MRV is a term that includes both standard operating procedures, and different methods and technologies to confirm the veracity of the project. As such, MRV tech is a term often used to describe the technology utilized within a standard operating procedure or identified in project design documents.

Offsetting

Offsetting is done through the purchase and retirement of carbon credits to offset emissions that occurred due to an organization's operations. The buying and selling of carbon credits to use in offsetting happens through the carbon market.

Retirement or Cancellation

Retirement refers to the removal of a carbon credit from a registry's list of active and issued credits after a single use so that the same ton of CO2 cannot be claimed more than once. Typically, once an organization has purchased a carbon credit and intends to claim the offset CO2 in their greenhouse gas reporting disclosures for a specific year, they retire the credit.

Voluntary Carbon Markets

The Voluntary Carbon Markets are privatized markets for carbon credits where companies can voluntarily purchase carbon credits from project developers or brokers. Projects in the voluntary market are usually governed by a nonprofit registry. These registries then issue carbon credits to the project developer once they submit a project design that follows one of the registries approved methodologies. These credits can then be traded and eventually "retired" by an organization, at which point the retirement beneficiary can claim the value of the offset emissions of the carbon credit.

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Image References

Figure 1: Satellite imagery, The São Damião and Boa Lembrança properties

Figure 2: The Sea and Land Surgace Temperature (SLSTR) instrument, Sentinel Online, url: sentinels.copernicus.eu/web/sentinel/technical-guides/sentinel-3-slstr/instrument

Figure 3: Triangular Greeness Index (VARI), ResearchGate, url: researchgate.net/figure/Triangular-Greenness-Index-is-based-on-the-area-of-the-triangle-formed-in-reflectance_fig1_340895640

Figure 4: Planet NiCFi SkySat basemap dataset, Sentinel Hub, url: apps.sentinel-hub.com/eo-browser/

Figure 5: BeZero Carbon Platform, url: bezerocarbon.com/platform/

Figure 6: The risk of CO2 leakage decreases with time after injection, Übermorgen, url: uebermorgen.vc/press/carboncredits

Figure 7: Pressure recovery of stored carbon, Pickering Engergy Partners, url: vliz.be/imisdocs/publications/360782.pdf