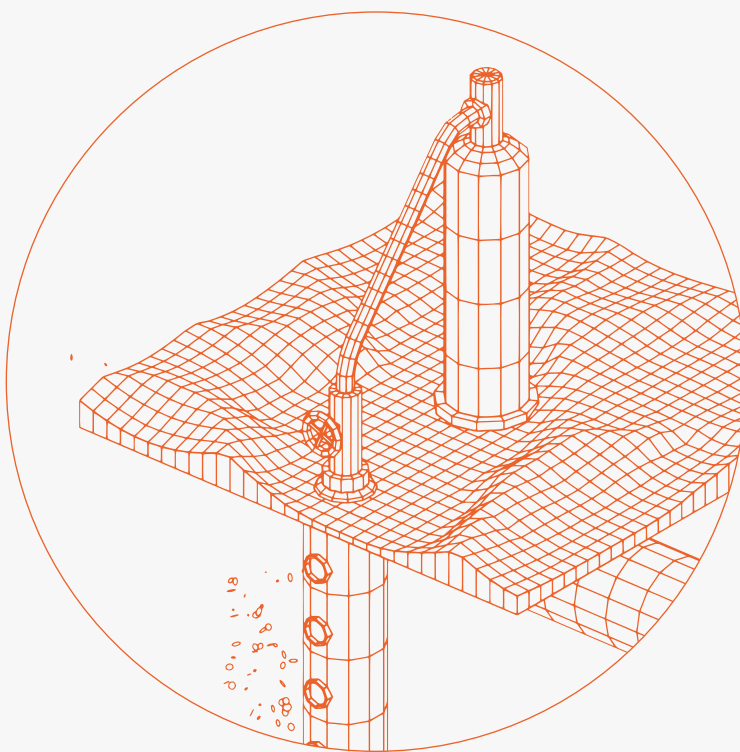
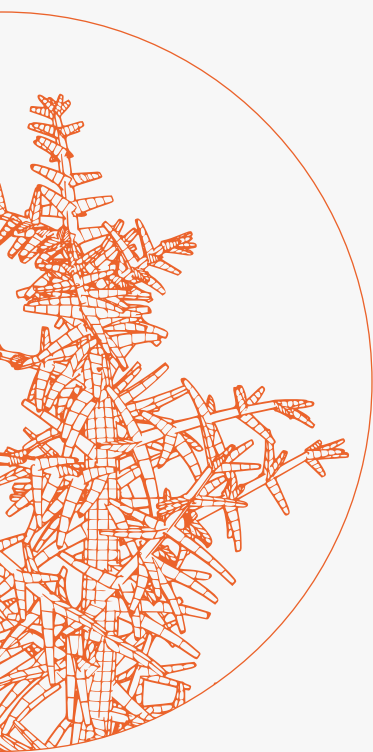


Integrity and diligence

A comprehensive framework
for evaluating carbon credit projects



"It's important to find a partner with deep expertise, like Patch, who you can trust to source and diligence high-integrity projects."



Sam Israelit
Partner and Chief
Sustainability Officer

BAIN & COMPANY 

01 Buyer-centric integrity and diligence



Buyer-centric integrity and diligence

The voluntary carbon market has numerous mechanisms for evaluating the integrity of carbon credit projects. These mechanisms vary by standard and validating body, and they evolve and change as science and technology advance.

Critically, they can't prevent a project from entering a market that's ultimately voluntary. At the same time, a project may have integrity while still not satisfying one or more of these mechanisms.

Corporate buyers face a practical challenge: the responsibility for allocating capital within the voluntary carbon market is theirs, but there's no single, uniform mechanism for ensuring integrity that can be generalized to every project nor every corporate carbon strategy.

This leads nearly every major carbon credit purchaser to run their own custom diligence program, which leaves resource-constrained teams with unacceptable tradeoffs between efficiency and integrity.

What's missing is a scalable approach to integrity and diligence that still keeps the individual buyer at the center — giving them a trusted way to filter projects, understand risk, and move quickly when credible supply becomes available.

Patch's Integrity and Diligence Framework is designed to meet that need. It brings together structured criteria, project data, technology, and expert judgment to turn a complex set of inputs into a clearer view of project integrity.

How Patch scales custom integrity and diligence

Depth in data

Our framework evaluates over 200 data points specific to each technology type. Since static screening criteria are frequently out of date within months, the framework is updated regularly based on the latest science and market dynamics.

Rigorous review

Every project undergoes at least three rounds of evaluation: AI eligibility screening, Foundational Integrity Review, and Comprehensive Project Diligence. This process covers carbon integrity and benefits beyond carbon, as well as optional custom diligence tailored to a buyer's specific requirements.

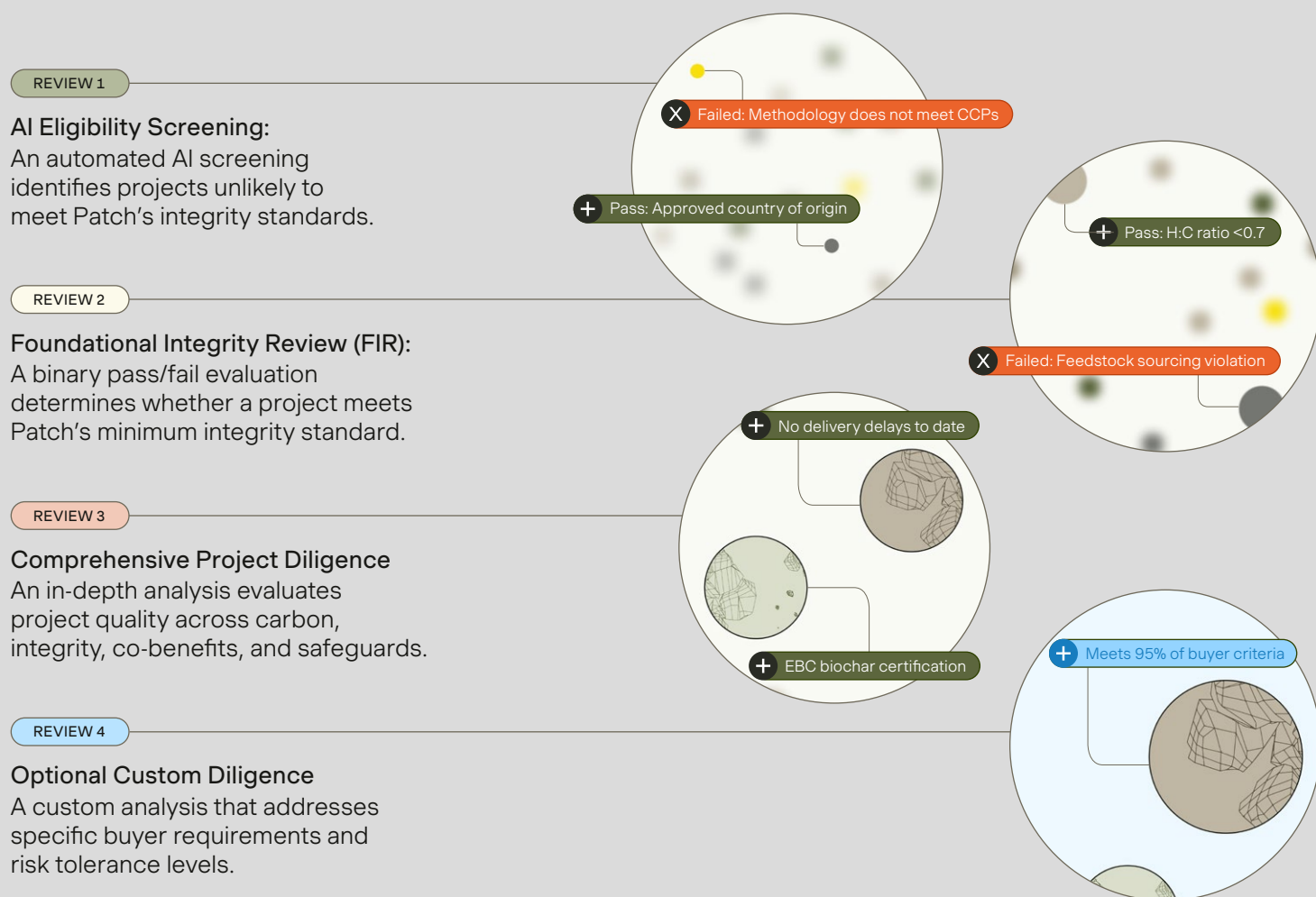
AI powered, expert validated

Expert human attention and intelligence is critical, but unscalable. With AI trained on our expertise and developed explicitly for the purpose of carbon project diligence, we can parse detailed data from disparate documents. Then, our team handles the judgment calls that require deep domain expertise.

02 The Patch Integrity and Diligence Framework

A structured framework for evaluating project integrity

Carbon buyers need a clear basis for understanding whether a project meets minimum integrity requirements, what evidence supports that assessment, and where deeper diligence may be appropriate. Patch applies a layered framework that combines automated screening, human-led Foundational Integrity Review, Comprehensive Project Diligence, and optional Custom Diligence.



The framework draws on established standards, the latest available science, and specialist expertise across project types. It is designed to bring disparate project data into a clearer, high-integrity view while remaining responsive as the market develops.

Different project types require different evidence and expertise, but some scrutiny risks apply to all of them. Evaluating a direct air capture project, for example, involves different questions from evaluating an avoided deforestation project — though both could involve similar concerns couched in similar language. Technology-specific review allows Patch to apply the most relevant criteria to each project while maintaining a consistent baseline for integrity.



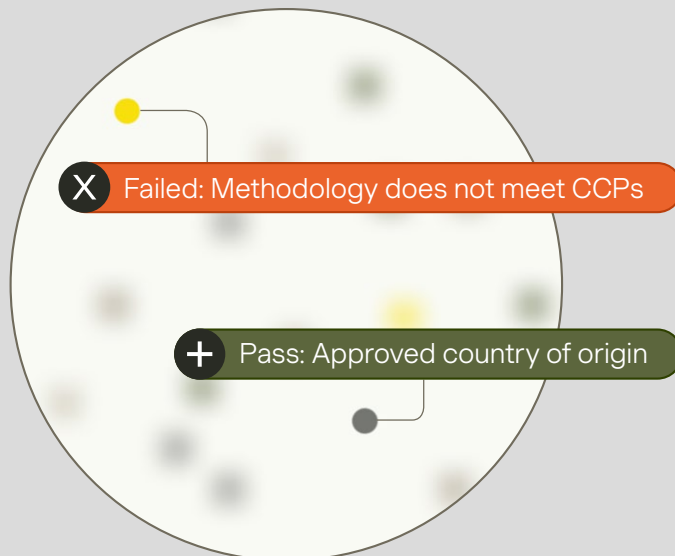
REVIEW 1

Automated Screening

Before formal review, every project undergoes an automated screening designed to identify projects unlikely to meet Patch's integrity standards.

This process uses AI to apply a set of objective auto-fail triggers across registry data, issuance status, ratings, geography, and methodologies. Projects that meet any of these criteria are filtered out before entering the formal review queue.

By removing projects with clear risk signals early, our proprietary heuristic automatically identifies the ~50% of projects in the VCM that would likely fail our Foundational Integrity Review, narrowing the universe of 27,000+ carbon projects to roughly 13,000 projects eligible for human review, allowing our scientific review to focus on the most credible candidates.



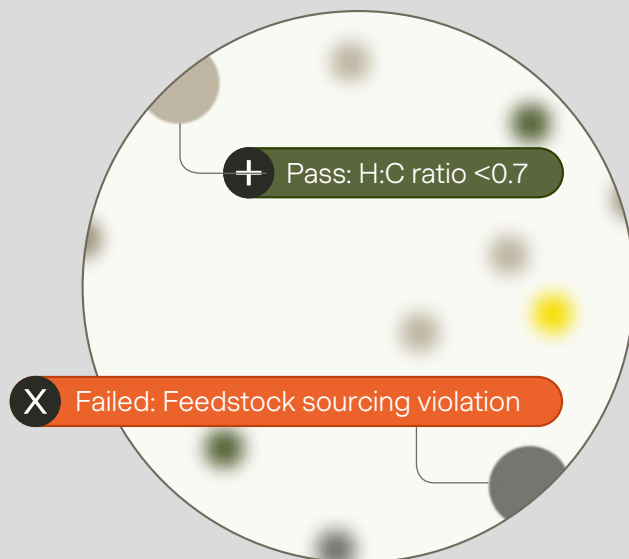
REVIEW 2

Foundational Integrity Review

Every project that appears on the Patch platform will go through our Foundational Integrity Review (FIR). This is a project type specific, pass/fail evaluation that determines whether a project meets the minimum threshold for integrity.

FIR is a carbon-focused, science-based framework developed in partnership with PhD-level climate scientists from Climate Focus, MSCI Carbon Markets, and Arizona State University's Center for Negative Carbon Emissions.

We update this framework regularly based on the latest climate science and emerging standards. We regularly re-review projects against our framework as we update it. These reviews are designed to anticipate market signals, maintain project diversity in the platform, and deliver against specific client requests.





REVIEW 3

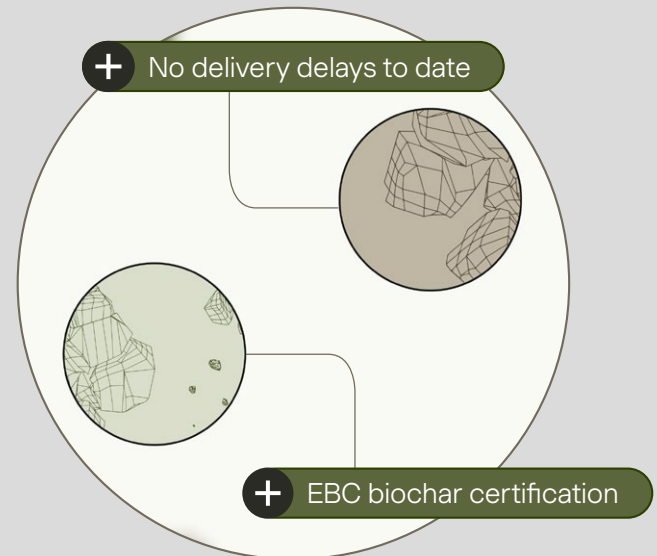
Comprehensive Project Diligence

Once a project passes the Foundational Integrity Review, we conduct Comprehensive Project Diligence.

This evaluation includes three critical domains:

1. Carbon Integrity Analysis
2. Co-Benefits Assessment
3. Track Record Evaluation

Not all projects are created equal. This layer provides the essential context buyers need to evaluate projects against their specific priorities. For example, buyers often value maximizing biodiversity impact, minimizing delivery risk, or aligning with particular SDGs.



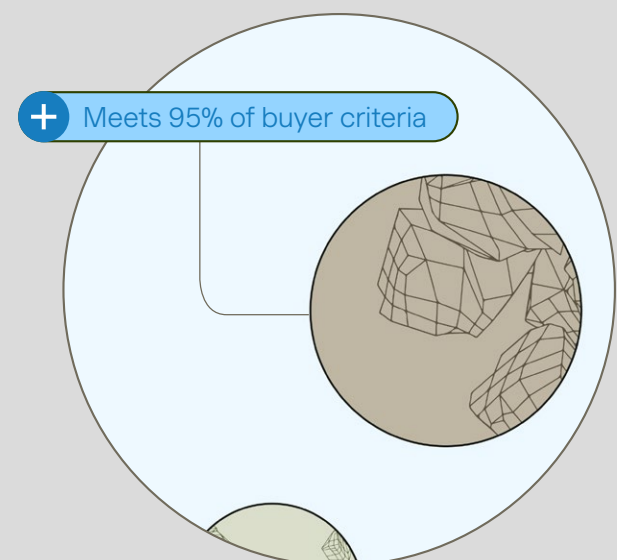
REVIEW 4

Optional Custom Diligence

For buyers with specific requirements or higher-risk tolerance concerns, Patch additionally offers deeper custom diligence tailored to each buyer's needs.

This analysis is designed to answer unique questions above what is essential for establishing integrity in order to align projects with a specific strategy, risk tolerance, or stakeholder expectations.

These reviews are built around each buyer's unique criteria. There are two general categories: Custom Diligence and Red Flag Review. Custom Diligence often includes rigorous analysis of a project's governance structures, financial, technological, and operational risks. These are typically suited for forward or spot purchases. A Red Flag Review is scoped based on a buyer's specific investment-grade needs and categorizes risks by level of severity to effectively address. We often see these applied to offtake agreements.





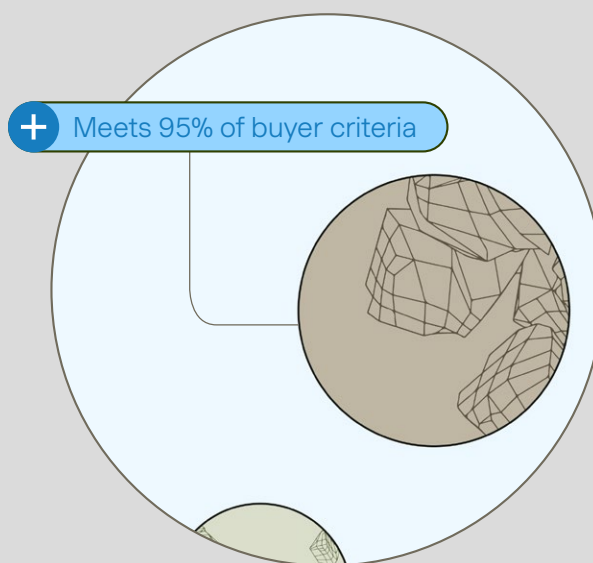
REVIEW 4

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Mitigating risk beyond diligence

Patch can't eliminate all risk. Our criteria create a high bar for integrity, and our team is here to help you navigate any pitfalls in the market — but all markets have risk.

Our goal is for Patch customers to have a sense of stability within the Patch purchase process, even as the market changes around us. And there are actions we can take to reduce the remaining risks inherent to engaging with carbon markets to make that sense of stability more concrete.

First, we make it as simple as possible to build a diversified carbon credit portfolio with a mix of traditional and nascent technologies from multiple suppliers within a single contract. Second, if any projects fail to deliver a future credit vintage, we can replace those credits with ones with similar project types and prices for no additional fee.

From landfill gas capture to enhanced rock weathering and every project type in between, these solutions are doing the work to mitigate climate change now and scale to gigatonne status for the future. They're accelerating the technology. Patch is accelerating the finance by reducing the risk of participating in the carbon market. When buyers have confidence, they can act decisively.

03 Foundational Integrity Review

Understanding our Foundational Integrity Review

The Foundational Integrity Review is Patch's baseline assessment of carbon project integrity. It brings together leading standards, the latest available science, and technology-specific expertise to establish a consistent foundation for evaluating projects.

The framework was developed through research and analysis of major standards, together with input from policy experts, scientists, suppliers, standards bodies, and other market participants. It is designed to support consistent evaluation while remaining responsive as the market develops.

The Foundational Integrity Review has two components:

- 1 Core integrity criteria:** Projects are evaluated against baseline requirements informed by the ICVCM Core Carbon Principles.
- 2 Technology-specific criteria:** The inputs needed to assess feasibility and climate value vary by methodology, so evaluations include assessments tailored to the project type.



1. Core integrity criteria

These requirements provide a baseline for evaluating a project's methodology, design, expected outcomes, verification, retirement, legal compliance, and other core integrity considerations.

The framework is designed to accommodate different project types while applying a consistent baseline for integrity and a clear path to deeper review when the evidence or risk profile requires it.

Verification and validation requirements

Projects may demonstrate that they've met Patch's verification and validation requirements by submitting an active link for a project registered against a certification standard. For a project that's not eligible to be certified under an existing standard or for a developer that elects not to be certified under a traditional methodology, it may or may not be possible to develop and verify all elements of a project with one third-party organization.

In these cases, we'll look for third-party verification of each step in the process. However, it's acceptable if this comes from different organizations. In fact, some organizations recommend that suppliers verify a project's methodology as part of a fully separate process from their project verification, because this ensures the project is optimized for its science and not its potential to issue credits.

Our approach increases the number of paths to getting this third-party stamp of approval. This will help newer projects scale with integrity more quickly.

OVERVIEW

Requirements at a glance

- **Methodology:** The project has a scientific methodology that has been verified by a qualified third-party reviewer.
- **Project design:** The project design document (PDD) for issuing carbon credits has been verified by a qualified third-party reviewer.
- **Outcomes:** The project's outcomes have or will be verified by a qualified third-party reviewer by the time the credit is issued and retired.
- **Retirement:** The project's credit issuances and retirements are or will be publicly tracked on a single registry.



Project design requirements

The project design document (PDD) for issuing carbon credits is verified by a qualified and independent third-party reviewer.

- **Qualified third party:** An ICROA-endorsed verifier or an ISO- or ANSI-certified verifier
- **Verification:** Certification against a specific methodology (e.g. VM0023) or verification against a specific standard (e.g. ISO 14064-2)
- **Independent entity:** A party that has no investment or employment interests with the project developer that is able to provide an unbiased evaluation of the project
- **Iteration:** The PDD will be re-reviewed 1) whenever the methodology is re-reviewed, 2) the project goes through an additional verification cycle, or 3) there are any updates to the PDD to reflect changes in project implementation

FOR CARBON CREDIT SUPPLIERS

ICVCM alignment

Each project must align with the ICVCM Core Carbon Principles, and adhere to CCP-approved methodologies when applicable. PDDs will include an explanation of the following:

Project Summary

- Brief project summary, which includes: project goals, location, greenhouse gas (GHG) assessment boundary, methodology eligibility, project team/developer, etc.

Project benefits and relevant metrics

- The metrics you're using to track project impact

Governance

- The supplier is tracking credits on a single registry, sharing all project documents publicly, and has considered legal status and property rights
- Information on project governance and analysis of project financials

Emissions impact

- Information on the project's GHG impact and monitoring plan, including how it will address baselining, permanence, and leakage

Sustainable development

- Information on the community and ecosystem co-benefits of the project

Funding and revenue

- Information regarding the project funding model, barriers to scaling, and capacity of the project to scale



Outcome requirements

The outcomes included as part of a monitoring report are or will be verified by a qualified third-party reviewer.

- **Qualified third party:** An ICROA-endorsed verifier, or an ISO- or ANSI-certified verifier
- **Ex-ante project flag:** A project that has not already issued verified credits at the time of listing must attest that a monitoring report will be developed, and its credits will be verified by a qualified third-party reviewer before the time the credits are sold and delivered

Attribution requirements

Project developers will provide assurance that no two parties are claiming credit for the same climate impact. This will take the form of a supplier attestation in its agreement with Patch.

Patch defines a registry as any entity that publicly tracks issuances and retirements of credits. This does not have to be the same entity as the qualified third-party reviewer to validate the organization's methodology or PDD.

- **Registry:** All credits from a project will be tracked on a single registry that must facilitate publicly-tracked and serialized issuances and retirements of credits
- **Tracking:** There is or will be a mechanism in place to track issuing, selling, and retiring of credits

Additional core requirements

These additional eligibility requirements aim to fill in the gaps where, historically, verification has not been enough to reduce or eliminate risk. These criteria are the most responsive to changes in the market.

The project must attest that it complies with local laws and regulations

Project governance is a key tenet of the new ICVCM Core Carbon Principles. Projects that do not comply with local laws and regulations are more likely to be cut short, underperform with respect to long-term permanence, or have detrimental impacts to local communities where the projects are based.

The project must be in compliance with the U.S. Department of the Treasury Office of Foreign Assets Control (OFAC) Sanctions and Embargo Programs and other applicable international sanctions
Patch maintains and regularly reviews a list of sanctions related to countries where we have suppliers or clients to ensure that we are compliant with any applicable legislation or restrictions. We have a process for identifying and reviewing suppliers that are located in countries where either individuals — or the countries themselves — have been sanctioned by the United States and other countries where our buyers are located to ensure projects are in compliance with applicable sanctions / embargoes.

Projects measuring permanence using tonne-year accounting are ineligible

Tonne-year accounting is a relatively new approach to quantifying permanence that allows a carbon credit's impact to be measured in single year increments. Tonne-year accounting can credit temporary storage against permanent fossil CO₂ emissions. For example, under this type of accounting, sequestering 100 tonnes of carbon for only one year would be equivalent to sequestering one tonne for a hundred years. This rewards short-lived storage while leaving the eventual reversal — and its cumulative warming effect — unaccounted for. It also clashes with corporate inventories based on annual physical tonnes, because it converts storage duration into discounted "equivalent tonnes" rather than reporting a durable removal and its reversal liability. Patch therefore does not allow tonne-year projects unless they have a predefined, enforceable permanence horizon of at least 40 years.

**Ex-ante credit acceptance requirements**

Most credits are issued ex-post, meaning the climate impact has occurred and project outcomes have been verified. However, in some cases, a credit may be issued ex-ante to reflect climate impact that is expected to take place over decades in the future.

Ex-ante credits may be sold on the Patch platform *as long as the mitigation activity has occurred at the point of credit issuance*.

Developers are otherwise responsible for the same validation and verification requirements: 1) verifying both their project and methodology, and 2) demonstrating a reasonable timeline for verifying outcomes.

For many new project developers, lack of early stage funding can be a huge barrier to scaling. That's common to start-ups of any kind. Because of this, we think it's important to integrate ex-ante crediting into our process in order to meet these new suppliers where they are and help them more easily overcome these early hurdles.

Suppliers are required to disclose their relationships with projects

We know that many buyers don't work directly with carbon credit developers, and that building trust with an anonymous developer can be hard. We've built this set of requirements to hold carbon credit suppliers accountable — from small start-ups to international aggregators. All suppliers must disclose details related to their carbon credits':

- Project development
- Project financing
- Project sales and marketing
- Project management
- Project data analysis and tracking
- Other (must describe)

If the supplier is not also the project developer, they must disclose the name of the project developer. Every project must adhere to the ICVCM Core Carbon Principles (this will be validated as part of a supplier's project design requirements). Among other things, this requires suppliers to disclose information on their organizations' revenues, expenses, and net assets over the past year, as well as provide an overview of major programs, activities, and governance.

2. Technology-specific criteria

The scientific diligence it takes to ensure a biochar project, for example, has integrity is extremely different from, say, an afforestation project. The inputs and the measurement are unique, and therefore, they need unique approaches to determining their climate impact beyond our general Core integrity criteria.

DEEP DIVE

Attributes affecting carbon credit integrity



Real and verifiable:

The project is using a scientifically rigorous methodology for monitoring and verification that has been reviewed by a group of experts in an appropriate field related to the project. There is a plan in place to re-review the methodology on a regular cadence at a minimum of every five years.



Additional:

Climate mitigation would not have occurred without this project, whether due to lack of funding, lack of policy, or lack of efficacy of traditional methods.



Permanent and durable:

The project's methodology addresses permanence and durability (i.e., how long the carbon will be mitigated through avoidance, reduction, or removal).



Leakage:

The project confirms it is not knowingly contributing to an unintended increase in emissions or shift of emissions from one place to another. The project also has a plan in place to account for any potential leakage. The methodology referenced above provides assurances around leakage management.



Enforceability:

The project is not double-counted, when multiple parties claim the same carbon mitigation.



Negativity:

The project results in a net negative reduction in atmospheric CO₂ (i.e. it does not generate more emissions to create the credit than the credit itself).



Baselining strategy:

For projects crediting against a baseline or counterfactual scenario, the strategy used to ensure the baseline is accurate must be scientifically sound.



MRV plans:

The additionality, durability, or leakage of a carbon credit project can only be reliably determined by accurate MRV methods. How the project plans to ensure this accuracy over its lifespan is critical to its integrity.

Project types:



**Nature-based solutions:
introduction and summary of attributes**

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Afforestation, reforestation and revegetation

p. 21



REDD+

p. 24



Improved forest management (IFM)

p. 27



Agriculture land management

p. 29



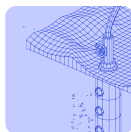
Blue carbon

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Cookstoves

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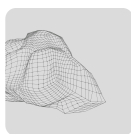
Landfill gas

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Renewable energy

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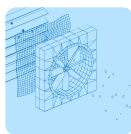
Biochar

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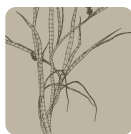
Enhanced rock weathering

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Engineered capture and storage

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BiCRS

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Ethanol BECCS

p. 55

While we have criteria for most project types, we don't have it for every single project type that exists. For projects we don't have detailed technology-specific criteria for, we're actively working on building it by working with scientists who are experts in those methodologies.

In the meantime, due diligence for these projects is conducted thoroughly by our in-house climate experts against the attributes listed above to ensure they meet our bar for integrity.

Nature-based solutions

Nature-based solutions (NBS) projects come in a few fundamental types of activities:

- Avoiding carbon loss from forest land (reducing logging, avoiding deforestation, avoiding conversion of forests, etc.)
- Removing carbon by growing new trees (restoration, reforestation, and improved forest management to improve productivity, etc.)
- Transitioning agricultural practices (moving from conventional agriculture to regenerative agriculture to improve soil carbon stocks)

Given that many NBS projects have overlapping project elements, certain criteria will span all project types, but there are also certain risks and benefits that are unique to specific project types. Below, Patch will cover variables important to NBS projects at a high level, and then review specific criteria per tech type.



Summary of key NBS variables

Additionality

Additionality is a principle that aims to ensure that the project scenario would not have occurred in the absence of carbon finance. For projects that are conducted on productive lands (such as farms or timber plantations) this is reliant on understanding the range of barriers that prevent land owners from transitioning to a project's proposed activities, or that there are no financial or legal incentives in place guiding land owners to transition towards project activities.

Baselines

The baseline scenario is defined as the most likely land use scenario that would have occurred in the absence of a carbon project (e.g., conversion of forest land to agriculture, or continuation of cattle ranching). A project's baseline is impacted by the following characteristics:

- Understanding the baseline rate of forest/ecosystem change, or the rate of change in forest cover area (hectares/year), that would occur in the project area in the absence of the project activities. This may refer to the rates of deforestation/degradation in the baseline scenario (REDD and IFM), or rates of natural regeneration in the baseline scenario (ARR and IFM).
- Accurate estimation of the ecosystem's carbon stock, or the total carbon content (in metric tonnes) that is stored within a defined land area and at a defined point in time. Projects must have both a rigorous sampling process and ensure that forest carbon stocks are accurate and representative of the project region's activities and environment.

Actual rates of deforestation

This variable represents the rate of deforestation or degradation that is monitored during the project crediting period. Evaluating actual deforestation rates during the project is critical to determining project effectiveness in protecting forests and delivering real emission reductions.

Leakage

Leakage is defined as the displacement of baseline activities and associated emissions outside the project boundaries.

- **Activity shifting leakage** occurs when baseline agents shift their activities outside the project area, causing emissions where activities are shifted to (e.g. a plantation project that displaces farmers and leads them to clear adjacent forests).
- **Market leakage** occurs when supply of commodities is significantly reduced as a result of the project, but market forces result in such supply being made up elsewhere (e.g. avoided deforestation practices in the project jurisdiction shifts demand to other areas where it becomes more profitable to deforest for crop or livestock production).

Leakage will reduce the climate impact of the project by creating additional emissions outside of project boundaries. Leakage risks can be evaluated by considering both leakage exposure (i.e. the risk that a deforestation agent will move their practices elsewhere) as well as evaluating the strategies a project has implemented to mitigate leakage.

Non-permanence risk

Non-permanence risk refers to the likelihood that carbon storage will be reversed through deforestation or forest degradation over different timeframes. Permanence can be subject to a range of internal project risks (like challenges with the duration of legally binding project agreements), external risks (like land tenure changes or political change) and natural risks (like forest fires, pest outbreaks, and extreme weather). Good project design has not only quantified potential project risks, but implemented a mitigation strategy to protect the project from the variety of potential project risks.

NATURE-BASED SOLUTIONS

CRITERIA

Afforestation, reforestation and revegetation



Afforestation, reforestation and revegetation (ARR) projects are removals projects that build carbon stocks through active reforestation and regeneration of non-forest land.

- **Afforestation:** forestation of a land that is non-forest in its natural state (like natural grasslands)
- **Reforestation:** re-establishment of forests on lands that have previously undergone tree-cover loss due to deforestation, land degradation, or land-use change
- **Revegetation:** re-establishment of other types of woody vegetation on degraded lands

ARR projects can have a number of primary objectives, including re-establishing forests that mimic a natural ecosystem, establishing agroforestry systems, or establishing forest plantations. All of these project types enhance carbon stocks, but each may require a distinct assessment of project aspects such as additionality.

Additionality

- Projects must demonstrate that their ARR activity is not common practice in the region.
- For commercial timber plantation projects, Patch assesses whether commercial reforestation is an established practice in the region using remote sensing and peer-reviewed data. Where commercial reforestation covers less than 8% of land cover, common practice is not considered a concern.

- For agroforestry projects, Patch assesses adoption using peer-reviewed literature and government-managed databases. Projects where agroforestry adoption exceeds 10% of agricultural land, assessed regionally where possible and nationally where regional data is unavailable, are ineligible.
- Projects must disclose any government subsidies, grants, or incentive programs that partially or fully finance project activities in the absence of carbon revenues. Where public financial support is sufficient to carry out project activities without carbon finance, the project is ineligible.
- Patch will not accept projects that include commercial timber plantations in well-established markets, as such projects may be sufficiently profitable without carbon finance.
- Where a project includes timber plantations but faces barriers to timber commercialization, Patch requires at least 20% of the project area to be set aside for native species reforestation with no timber harvesting.
- Projects must demonstrate regulatory surplus. Where the project area falls within a legally mandated reforestation zone or overlaps a government-funded reforestation program, the project must justify why carbon finance is needed despite those incentives.
- Projects must present a sound financial analysis through their validated PDD. Financial additionality is assessed in three tiers according to a project's revenue profile.

NATURE-BASED SOLUTIONS

CRITERIA

Afforestation, reforestation and revegetation

- **Tier 1:** projects that generate no revenue from timber sales, agroforestry products, or other non-carbon sources are considered financially additional without a detailed financial model.
- **Tier 2:** agroforestry and limited-revenue projects must demonstrate that 100% of revenues from timber, fruit, or other agricultural products flow directly to participating farmers or landowners, supported by a cost breakdown showing that non-carbon revenues fall short of project costs. Agroforestry projects centred on timber harvesting are ineligible, due to lower durability and ecosystem harms.
- **Tier 3:** commercial and significant-revenue projects require a quantitative financial analysis modelling performance with and without carbon revenues. Carbon revenues must account for more than 25% of total projected project revenues. Where a project benchmarks against jurisdictional timber returns, the benchmark must be independently sourced, and the project's return without carbon revenue must fall more than 100 basis points below it.

Baseline

- Projects must present a conservative, well-justified baseline. A baseline representing the status quo of the last 10 years is considered well justified, and projects using a methodology that requires dynamic baselining, as in VCS methodology VM0047, are eligible.

Accurate estimation of forest carbon stocks

- Carbon stock estimates must be based on a forest inventory with permanent sample plots or a combination of permanent sample plots and remote sensing.
- Patch will collect data from project developers on inventory design including forestry types and the number of sample plots per forest type to evaluate whether estimates are representative.
- While satellite mapping may not be financially feasible year-on-year, a project must demonstrate that their monitoring efforts are comparable and robust.
- Projects relying exclusively on remote sensing, with no permanent sample plots within the project boundary, are not eligible.
- Permanent sample plots must be periodically re-measured.
- Any carbon stock monitoring method other than permanent sample plots alone, or permanent sample plots combined with remote sensing, is treated as a novel approach. This includes national forest carbon inventories, LiDAR-based biomass mapping, and experimental satellite-derived biomass products. Novel approaches are assessed directly by Patch and market experts, with bespoke eligibility criteria for each.
- The PDD must explicitly quantify and justify carbon stocks under the baseline land use. Where the PDD is silent, Patch refers to the project's approved methodology.
- Stratification must at least account for different land cover classes.
- Projects must demonstrate that allometric equations and biomass expansion factors are appropriate for the vegetation type being established. Where local, species-specific equations are not used, the project must justify why its assumptions are conservative.

NATURE-BASED SOLUTIONS

CRITERIA

Afforestation, reforestation and revegetation

Leakage

- If baseline production activities (e.g., agriculture or livestock production) are not affected, the project faces no leakage risk.
- If production is reduced within the project area, projects must have a robust leakage mitigation plan in place.
- Projects without an adequate mitigation plan are ineligible.
- Production is considered significantly reduced where the reduction in volume exceeds 5%.
- Where production is significantly reduced, projects may either take a suitable leakage deduction in accordance with the methodology, or present a valid leakage management plan that makes up for the production loss outside the project area.

Illustrative project zoning for AUD leakage monitoring

Project area
Leakage belt



Non-permanence risk analysis

- A project is eligible if it has a non-permanence buffer pool higher than 20%.
- If a project's buffer pool is lower than 20%, a project must demonstrate that it has legitimately assessed internal, external and natural risks, and developed a robust mitigation plan for those risks.
- Credit volumes must be calculated based on annual removal rates vs. long-term averages to ensure year-on-year risk is accounted for within issuance cycles.
- The risk analysis must address fire risk, particularly in seasonally dry or fire-prone ecosystems; pest and disease risk, especially for commercial monoculture plantations; political and social risk, including land tenure security and community conflict; and the management capacity and financial continuity of the project developer.
- Risk factors scored as minimal without adequate justification are flagged as a concern.

NATURE-BASED SOLUTIONS

CRITERIA

REDD+



REDD+ and conservation of loggable forests, or CLF, projects reduce emissions from human-driven deforestation, forest degradation, and logging. Patch distinguishes among three broad project types:

- **Avoiding Unplanned Deforestation or Degradation, or AUD**, which addresses unauthorized deforestation or degradation
- **Avoiding Planned Deforestation, or APD**, which addresses authorized conversion of private land for activities such as commercial agriculture or cattle production
- **Conservation of Loggable Forests, or CLF**, which conserves existing carbon stocks by reducing or halting harvesting in productive forests

REDD+ projects face heightened scrutiny because their impact depends on measuring complex forest systems, establishing credible deforestation or degradation baselines, and demonstrating that the project will change future behavior.

Additionality

Historical land cover and accessibility

The project area and surrounding region should show historical deforestation or degradation consistent with the proposed baseline. Infrastructure such as roads, rivers, agricultural frontiers, and market access should also make the proposed baseline activity commercially or logistically credible.

Where the project area has experienced little or no relevant land-cover change and is remote from the infrastructure needed to carry out the baseline activity, the project may not be additional.

Easements

Development or conservation easements do not automatically disqualify a project. However, their effect must be fully incorporated into both the baseline and project-impact calculations.

Financial additionality

Projects with no non-carbon revenue may be financially additional. Projects with timber, commodity, or other revenue must provide a sound financial analysis showing that the activity would not be financially viable without carbon finance.

For APD projects that prevent logging of previously unlogged forests, financial additionality must be supported by evidence that the area was genuinely at risk. Historical land-cover change, access to infrastructure, and access to relevant markets should support the proposed baseline scenario.



NATURE-BASED SOLUTIONS

CRITERIA

JREDD

Projects nested under ART TREES, FCPF, or equivalent jurisdictional programs must demonstrate at least one concrete new or enhanced mitigation action that was not already in place before enrollment.

Examples include:

- New legislation
- Expanded law enforcement
- New protected-area designations
- Community land-tenure programs
- Deforestation moratoriums

For projects claiming an HFLD-adjusted allocation under FCPF or ART-TREES, HFLD credits are not transacted by Patch. Only non-HFLD credits may be offered for sale. If HFLD and non-HFLD credits cannot be separated, the project is not eligible.

Baseline

A REDD+ baseline may be considered well justified when it reflects the status quo of the previous 10 years. Baselines that diverge materially from observed historical trends without a clear explanation require additional scrutiny.

Where reference or proxy areas are used, they should be comparable to the project area in terms of:

- Land title and zoning
- Infrastructure and market access
- Proximity to population centers
- Slope
- Agro-ecological conditions

For APD projects, the baseline deforestation agent should be identified. If the specific agent is unknown, the project should identify the relevant type of agent and provide evidence that comparable agents operate in the region.

JREDD projects should also be assessed for:

- Anomalous deforestation spikes in the one to three years before project start
- Evidence that deforestation was already declining at enrollment
- The possibility that the project is receiving credit for an existing trend rather than new action



NATURE-BASED SOLUTIONS

CRITERIA

Carbon stock measurement

Carbon stock estimates should be based on permanent sample plots, or permanent sample plots combined with remote sensing. Field data should be reviewed and plots should be remeasured.

Novel monitoring approaches, including LiDAR, synthetic aperture radar, and drone-based surveys, require additional review.

LiDAR-based approaches must include field plots and must be suitable for the ecosystem being measured.

Stratification should account for tree species mix and stand age. Allometric equations and biomass expansion factors should be appropriate for the vegetation type. If non-local or non-species-specific equations are used, the project should provide a conservative justification.

Actual deforestation and degradation

For AUD projects, the average annual deforestation rate during each monitoring period should remain below 0.5% of remaining forest cover at the start of the project. If the rate exceeds 0.5% in a monitoring period, deforestation is not considered well controlled.

For APD and CLF projects that claim to conserve loggable or convertible forests, logging and conversion should be zero during the monitoring period.

In areas with a high risk of illegal deforestation, forest loss caused by encroachment may be acceptable where the monitoring and verification reports clearly identify the cause and the loss remains below 0.5% of the project area in a given year.

Leakage**APD and CLF**

Where the deforestation or logging agent is known, monitoring should cover the other land under that agent's control to identify activity shifting.

Where only the type of agent is known, the project should monitor comparable agents in the region and report whether their activity has increased.

Where the baseline includes timber harvesting or commodity production, the project should demonstrate how lost production will be replaced or apply a leakage deduction of at least 20%. Projects that model leakage, including through the global timber model, are exempt from this threshold.

AUD

AUD projects should establish and monitor a leakage belt around the project area. The belt should contain at least the same number of forest hectares as the project area at project start and should be comparable in land cover, accessibility, infrastructure, and topography. Projects under VM0048 are not subject to this leakage-belt requirement.

Where mobile agents account for more than 5% of baseline deforestation, the project should apply additional monitoring beyond the leakage belt or a minimum 20% leakage deduction.

JREDD

JREDD projects that cover only part of a jurisdiction (e.g. a state) must monitor deforestation in the rest of the jurisdiction. They cannot assume zero intra-jurisdictional leakage.

Projects covering the full jurisdiction must assess cross-boundary leakage in neighboring jurisdictions or regions.

Projects should also assess nearby mining concessions. Where project activities may displace mining or mineral extraction, the project must account for the resulting leakage.

Non-permanence risk

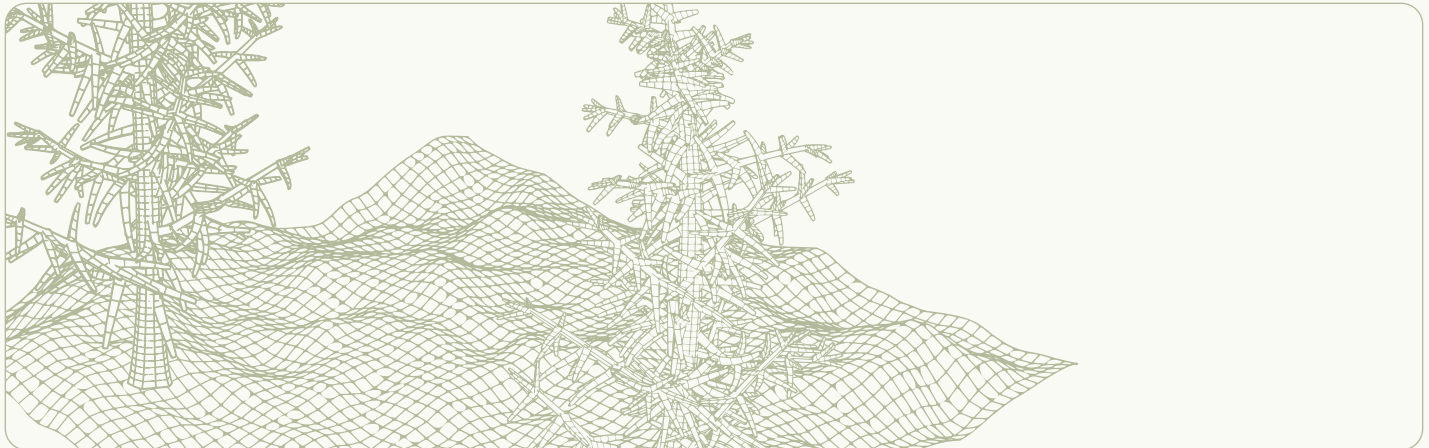
A non-permanence buffer of at least 20% meets this criterion. Where the buffer is lower, the project must provide a robust risk assessment covering internal, external, and natural risks.

This includes financial viability, project longevity, land-tenure security, political risk, fire, pests and disease, and extreme weather. Where fire accounts for more than 5% of forest cover loss in the project area and is not included in the risk assessment, the project is not eligible.

NATURE-BASED SOLUTIONS

CRITERIA

Improved forest management (IFM)



Improved forest management (IFM) projects reduce emissions and improve carbon stocks in managed forest land (commonly used for timber production) through mechanisms such as reducing logging, increasing forest productivity, or optimizing carbon stocks through silvicultural treatments. IFM projects can be diverse, and often include a combination of goals aimed to both reduce and remove emissions.

One of the most complex aspects of an IFM project is ensuring that the baseline adequately reflects forest management that would have happened in the absence of the project. IFM projects that reduce production within a project area also have a higher inherent risk of market leakage because reduced timber supply can be readily made up through increased harvesting in other timber lands.

Improved forest management, or IFM, projects change the management of existing forests to reduce emissions, improve forest carbon stocks, or conserve forests that would otherwise be logged. This section applies to IFM projects outside the CLF pathway.

Additionality

Financial additionality

Projects with no non-carbon revenue may be financially additional. Projects with timber or other product revenue must provide a sound financial analysis demonstrating that the project would not be financially viable without carbon finance.

IFM projects focused on reduced logging, improved management, or restoration may be eligible where the financial analysis is credible.

Easements

Development or conservation easements do not automatically disqualify a project, but their effects must be fully reflected in the baseline and project-impact calculations.

Regulations and common practice

Project activities must go beyond applicable laws, regulations, best management practices, and common industry practice.

Examples include:

- Extended rotation lengths
- Reduced harvest intensity
- Riparian buffer maintenance

The project must demonstrate a material departure from standard practice. Otherwise, the activity is not additional.

NATURE-BASED SOLUTIONS

CRITERIA

Improved forest management (IFM)

Departure from baseline practices

Project activities should represent a measurable change from what occurred before the project start date. If the project continues the same harvest intensity, rotation length, species composition, or land use as the baseline, it does not generate additional climate benefit.

Project activities previously supported by public forestry or “payments for ecosystem services” programs, as is often the case for Mexico Forest Protocol projects, require additional evidence. Where public funding has ended, the project must document why it ended, such as an expired grant, a policy change, or a rejected funding application.

Baseline

IFM projects that include restoration should account for natural or active regeneration that would have occurred without the project.

- Projects that account only for removals must demonstrate that baseline carbon stocks would have remained stable or declined. If baseline carbon stocks were increasing by more than 0.1% per year before the project, over-crediting is likely.
- Projects that avoid or reduce harvesting must show that logging would have occurred under the baseline and that the assumed rate is conservative. The baseline logging agent should be identified where possible. If the specific agent is unknown, the project should demonstrate that comparable agents routinely acquire or operate on similar land in the region.
- For dynamic baselines, reference areas should be comparable in land title and zoning, infrastructure and market access, proximity to population centers, and slope.
- Where a single landowner is involved, baseline harvesting rates should align with the land’s management history or forest management plan. For NPV-maximizing baselines without proxy analysis, projected harvesting volumes should align within 15% of the volumes in the area’s existing forest management plan or historical harvesting rates.
- For projects with multiple smaller landowners, baseline logging rates should be compared with regional data for comparable landowners through dynamic baselining or a comparative property analysis. Rates that exceed the regional average without justification are not acceptable.

Carbon stock measurement

Carbon stock estimates should use permanent sample plots, or permanent sample plots combined with remote sensing. Plots should be remeasured and field data should be reviewed.

Novel monitoring approaches require additional review. LiDAR-based approaches must include field plots and must be appropriate for the ecosystem.

Baseline carbon stocks at year zero should be estimated using project-level forest inventories or robust local studies. Regional common-practice data alone is not sufficient.

Stratification should at least account for land cover classification. Allometric equations and biomass expansion factors should be appropriate for the vegetation type, with conservative justification where non-local or non-specific equations are used.

Leakage

IFM projects should first determine whether project activities reduce timber or pulp production.

Where production is reduced, the project should monitor whether harvesting increases on other lands under the control of the same agent or whether the agent acquires additional land to increase harvesting elsewhere.

The project must demonstrate how lost baseline timber production will be replaced or apply a leakage deduction of at least 20%. Projects that model leakage through the Global Timber Model are exempt from this threshold.

Leakage deductions should align with projected harvesting rates over time. A constant deduction that does not reflect changing harvesting rates is not acceptable.

NATURE-BASED SOLUTIONS

CRITERIA

Agriculture land management



Agriculture land management (ALM) projects may focus on increasing carbon stocks by enhancing soil carbon, changing agricultural practices to promote sustainable and regenerative management, or sequestering carbon in woody biomass. Many ALM projects rely on contracting with small, individual farmers and landowners, so special attention should be paid to how contracts are structured to avoid risk of reversal over the long term.

These removals projects have many similar risks and benefits to ARR projects, so at a high level, the criteria for this set of projects is quite similar. Patch will continue to develop more specialized criteria for this set of projects (with a focus on quantifying soil organic carbon, which is a complex and rapidly emerging sector for carbon projects) as they become more prominent on the market, and this review can now be conducted case by case.

Additionality

Financial additionality

Financial additionality is generally less significant for regenerative agriculture projects because these activities can involve upfront costs and short-term yield declines before longer-term benefits appear. A formal financial additionality assessment is generally not required where the project depends on carbon finance to fund the transition.

Common practice

Each individual practice must have an adoption rate below 20% within the relevant geographic unit, such as a county or region.

Where regional data is unavailable, the project should provide verifiable empirical evidence that the practice is not common. When multiple practices are combined, each practice must be assessed separately. If any individual practice exceeds the 20% threshold, the project is not eligible.

Regulatory support

Project activities must not be required by law or regulation. Projects must also account for grants, subsidies, tax incentives, and other policy mechanisms that could independently drive adoption.

Where regulations or policy support overlap with the project activities, the project should demonstrate that its practices go beyond what is required or already supported.

Baseline

The baseline should reflect what would have continued on the land without the project. The project should demonstrate that the current agricultural use has been the status quo for at least the previous 10 years.

Projects should also verify pre-project soil organic carbon trends using field data or modeling.

For crop-based projects, the analysis should cover at least one full crop rotation, generally three to five years, and should account for any increase that would have occurred without the project. Where possible, the analysis should span at least three years, or five years where rotation data permits.

NATURE-BASED SOLUTIONS

CRITERIA

Agriculture land management

Carbon stock measurement

Carbon stock estimates should be based on permanent sample plots, or permanent sample plots combined with modeling. Modeled-only approaches are not eligible. For measured and modeled approaches, the model should be calibrated under conditions comparable to the project, including weather, soil type, and crop rotation. Soil samples should be collected to a minimum depth of 30 centimeters.

Recognized soil carbon measurement techniques include:

- Dry combustion, or the Dumas method
- Proximal sensing, including NIR, Vis-NIR, MIR, LIBS, or INS, subject to appropriate calibration
- Walkley-Black wet oxidation
- Loss on ignition

Novel measurement methods, including remote sensing of soil carbon require additional review.

Projects must quantify measurement uncertainty and apply conservative discounting. This may include a deduction based on a confidence interval or a percentage reduction proportional to model uncertainty.

Projects involving grazing must account for all relevant livestock emissions, including methane from enteric fermentation and manure management, as well as nitrous oxide from manure and soil nitrogen cycling. Herd monitoring should be defined, and any increase in herd size relative to the baseline should be reflected in the project's net carbon balance.

Leakage

ALM projects should assess activity leakage and market leakage separately. Where production is not reduced, or is positively affected by less than 10% relative to the baseline, the project should monitor crop yields over the project period.

Where production is reduced, the project must have a validated leakage management plan. The plan should include:

- A quantified leakage estimate
- Monitoring of relevant off-site areas
- A corresponding credit deduction where leakage cannot be fully mitigated

For pre-validation projects, a leakage monitoring plan that includes crop-yield measurement is sufficient for this criterion.

Non-permanence risk

Soil carbon can be reversed through tillage, land-use change, drought, flooding, or other changes in management. Projects must therefore have a legally binding Project Implementation Agreement with participating farmers or landowners.

The agreement should require monitoring throughout the full permanence period. A buffer pool above 20% meets the buffer criterion. For lower buffers, the project must provide a project-specific risk analysis covering internal, external, and natural risks, including drought and flood risk, and must present a mitigation plan.



NATURE-BASED SOLUTIONS

CRITERIA

Agriculture land management

Additionality

- Projects must present a sound financial analysis through their validated PDD.
- A project must present a legitimate case that it drives a real change toward effective regenerative practices, as opposed to modest changes to conventional agriculture.

Baseline

- Projects must demonstrate that the baseline represents the status quo from the last 10 years.

Accurate estimation of carbon stocks

- Carbon stock estimates must be based on permanent sample plots, or a combination of permanent sample plots and modeling. Approaches based only on modeling are not eligible, and other approaches such as remote sensing of soil organic carbon are assessed by Patch on a case-by-case basis.
- While satellite mapping may not be financially feasible year-on-year, a project must demonstrate that their monitoring efforts are comparable and robust.

Leakage

- If production (i.e. livestock grazing) is not impacted by project activities, a project does not face market or activity leakage risks.
- If production is reduced within the project area, projects must have a validated leakage mitigation plan in place.

Projects without an adequate mitigation plan are ineligible.

Non-permanence risk analysis

- A project is eligible if it has a non-permanence buffer pool higher than 20%.
- If a project's buffer pool is lower than 20%, the project must demonstrate that it has legitimately assessed internal, external, and natural risks, and developed a mitigation plan for those risks. In particular, risk assessments should address drought and flood risk.
- Credit volumes must be calculated based on annual removal rates vs. long-term averages to ensure year-on-year risk is accounted for within issuance cycles.
- The project must have a legitimate agreement in place with farmers to protect against non-permanence.

NATURE-BASED SOLUTIONS

CRITERIA

Blue carbon



Blue carbon projects focus on capturing and sequestering carbon in oceans and coastal ecosystems, such as seagrasses and mangroves. There is a lot of potential variety in blue carbon projects, from avoided emissions work that closely resembles REDD+ to mangrove reforestation projects.

Blue carbon projects cover mangroves, seagrass meadows, tidal marshes, peatlands, and other coastal and wetland ecosystems.

A blue carbon project may follow different pathways depending on its activity:

- Protecting existing tree cover from conversion or degradation follows REDD+ criteria
- Restoring degraded or cleared tree areas follows ARR criteria
- Improving management of existing tree stands follows IFM criteria

All blue carbon projects are also subject to additional criteria reflecting the specific risks of coastal and wetland ecosystems.

Blue carbon ARR

Additionality

Blue carbon ARR projects must demonstrate regulatory surplus and financial additionality using the ARR framework.

Where the project has no timber, agricultural, or other non-carbon revenue, the absence of a competing revenue stream may be sufficient to demonstrate financial additionality. Agroforestry or other projects with non-carbon revenue must demonstrate how revenue is distributed and why it is insufficient to cover project costs. Commercial projects require a quantitative financial model and must demonstrate that carbon revenue represents more than 25% of projected revenue.

Baseline methane emissions

Projects that claim methane reductions should compare their baseline methane emission rates with peer-reviewed literature for the same or a closely comparable ecosystem, region, and land-management condition.

Reported rates should generally fall within approximately 20% of the relevant literature range unless the project provides a clear justification.

NATURE-BASED SOLUTIONS

CRITERIA

Blue carbon

Leakage

Projects should assess whether restoration or management activities reduce production by more than 5%.

Where production is reduced, the project should demonstrate how lost production will be replaced outside the project area or provide a robust leakage management plan. The plan should identify the expected leakage, the monitoring approach, and any corresponding deduction where leakage cannot be fully mitigated.

Non-permanence and survival rates

Blue carbon risk assessments should consider the internal, external, and natural risks relevant to the project, including sea-level rise, ocean acidification, and ocean warming.

For restoration projects, survival rates above 80% during the first five years should be scrutinized. The project should provide evidence supporting unusually high survival rates, including the monitoring method, species planted, site conditions, and any replanting.

Unsupported survival rates above 80% during the first five years are not acceptable.

Carbon stock measurement

Blue carbon ARR projects should use permanent sample plots, or permanent sample plots combined with remote sensing. Novel monitoring approaches require additional review. LiDAR-based approaches must include field plots and be appropriate for the ecosystem.

Stratification should account for tree species mix and stand age. Allometric equations and biomass expansion factors should be appropriate for the vegetation being measured.

For projects that credit soil organic carbon, acceptable approaches include direct soil-core sampling and local accumulation rates derived from peer-reviewed studies in the same ecosystem and region.

Non-local accumulation rates, including IPCC defaults, are acceptable only where the project demonstrates that the reference ecosystem is comparable in vegetation, climate, and salinity.

Allochthonous carbon, meaning carbon transported into the ecosystem from external sources such as river sediments or marine inputs, must be addressed. Projects claiming enhanced soil carbon sequestration should make appropriate deductions using local data, distinguish mineral and organic carbon fractions, or apply an appropriate default where local data is unavailable.

Projects that omit allochthonous carbon without justification are not eligible. Zero deductions may be considered only on a case-by-case basis.

Blue carbon REDD+ and CLF

Blue carbon REDD+ and CLF projects must meet the applicable REDD+ and CLF criteria, including:

- Evidence of historical deforestation or degradation
- Credible access for the proposed baseline agent
- Financial additionality where non-carbon revenue exists
- A conservative baseline
- Comparable reference or proxy areas
- Appropriate monitoring of actual deforestation or degradation
- Leakage monitoring and deductions
- A robust non-permanence risk assessment



NATURE-BASED SOLUTIONS

CRITERIA

Blue carbon

Mangrove projects should use appropriate mangrove-specific data when assessing historical land-cover change. The baseline should also be based on directly measured methane emissions where methane reductions form part of the credited impact (e.g. peatlands).

Carbon stock monitoring should use permanent sample plots, or permanent sample plots combined with remote sensing. Stratification, allometry, and soil carbon accumulation should follow the blue carbon requirements above.

For AUD projects, average annual deforestation above 0.5% of remaining forest cover during a monitoring period is not acceptable. For APD and CLF projects, continued logging or conversion is generally not acceptable.

Where timber or commodity production is reduced, the project should replace lost production or apply the relevant leakage deduction. JREDD projects must address both intra-jurisdictional and cross-boundary leakage where applicable.

Blue carbon IFM

Blue carbon IFM projects must meet the applicable IFM criteria, including:

- Financial additionality
- Assessment of regulations and common practice
- Evidence of a genuine departure from baseline management
- A credible baseline logging or management scenario
- Appropriate carbon stock monitoring
- Measurement of baseline carbon stocks at year zero
- Leakage monitoring and deductions
- A robust non-permanence risk assessment

Projects should assess whether timber, pulp, or other production is reduced. Where production is reduced, the project should demonstrate how lost production will be replaced or apply a leakage deduction of at least 30%. Projects that model leakage through the global timber model are exempt from this threshold.

Leakage deductions should follow projected harvesting rates over time rather than remaining constant throughout the crediting period.

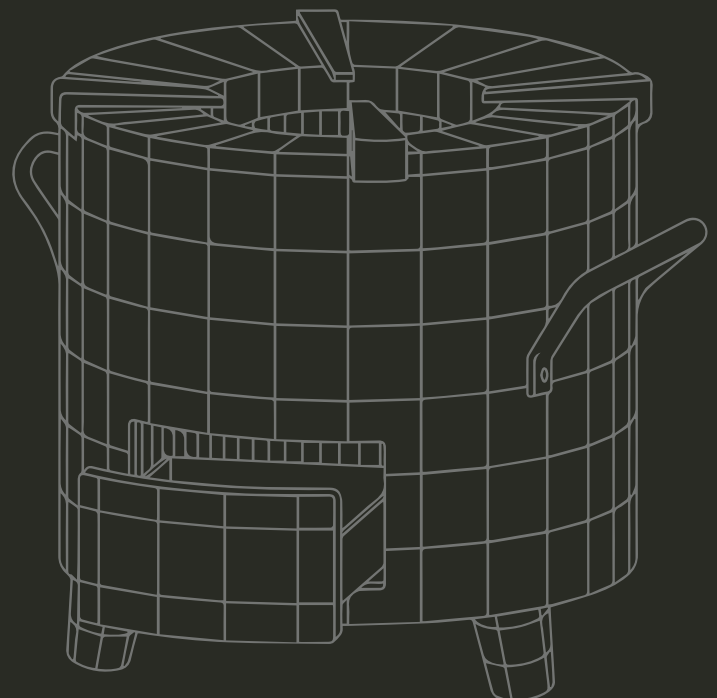
Blue carbon-specific requirements also apply to soil carbon accumulation, allochthonous carbon, baseline methane emissions, and risks from sea-level rise, ocean acidification, and ocean warming.

Cookstoves

Cookstove projects introduce a clean or improved cookstove technology or fuel into households or institutions (e.g. schools) that either reduces the amount of fuel used for cooking or switches the cookstove to renewable or less carbon-intensive fuel. The cookstove project category can broadly be divided into two project activity types:

Improved efficiency cookstoves projects swap out traditional firewood- or charcoal-burning cookstoves with more efficient varieties. When the cooking process is more efficient, less fuel is required to cook the same amount of food.

Fuel-switching cookstoves projects involve transitioning from traditional firewood- or charcoal-burning cookstoves to those using lower-emissions fuel, such as Liquefied Petroleum Gas (LPG), domestic biogas, or electricity.



CRITERIA

Cookstoves

Fraction of non-renewable biomass rate

The fraction of non-renewable biomass (fNRB) is the portion of wood fuel used in a carbon project that is unsustainable and contributes to long-term loss of biomass carbon stocks. The fNRB is a critical input into the emission reduction calculation of clean and improved cooking carbon projects as the amount of fuel used before and during the project is multiplied by this share to estimate net changes in emissions. If projects use fNRB estimates that are higher than the actual value, then they are claiming more emission reductions than their projects are achieving.

Ideally, fNRB rates would be based on place specific data. In place of local data, most methodologies allow applying a global conservative default fNRB of 0.3, applying a value sourced from peer-reviewed literature, or using a methodological tool (Tool 30) developed by the UNFCCC. While the first two options are the easiest to apply and are transparent, applying Tool 30 generally results in higher fNRB values and, consequently, higher rates of crediting.

In addition, older projects apply the Clean Development Mechanism's (CDM) default values that were valid until between 2017 and 2020. As the default fNRB values established under the CDM were between 65–100%, this set a precedent for fNRB values to be in this range. More recent research has shown that the fNRB values should be in the range of 1–62%. Given the difference between the CDM's default values and those published in recent literature, project developers often choose to apply Tool 30.

Patch will compare a project's fNRB values to those published in peer-reviewed scientific literature. High-integrity projects should use either the applicable Tool 30 value for pre-2026 reductions or values from the MoFUSS model.

Projects will be eligible if they use a value equal or smaller than the one published by the UNFCCC report: [Updated fNRB Values for Woodfuel Interventions](#).

Note: A vast quantity of existing projects on the market apply overinflated fNRB rates. However, a number of projects may also be undercrediting due to their emissions factor for fuelwood (see next criterion). Below, we'll describe where projects with overinflated fNRB rates may be eligible.

Emission factor of fuelwood

The emission factor of fuelwood represents the amount of CO₂e released into the atmosphere per unit of energy that the combusted fuel contains. The IPCC has established a default emission factor for fuelwood of 112 tonnes (t) of CO₂e per terajoule (TJ) energy delivered. However, CDM methodologies require projects to apply a much more conservative value based on fossil fuels — between 63.9–85.7 tCO₂e/TJ. As this is a source of undercrediting, it makes a project more conservative.

- If the project applies an emission factor that is lower than 112 tCO₂e/TJ, Patch will calculate the difference between the applied value and 112 tCO₂e/TJ. If a project overestimates fNRB but also overestimates the emission factor of fuelwood by a minimum ratio of 1:1, the project is eligible.

Amount of fuel used in the baseline

In cookstove projects, the amount of emission reductions achieved by a project depends on the reduction of baseline fuel used. There are several approaches to determining baseline fuel use, including applying global default values, use of national household/ demographic surveys or baseline surveys, back-calculating the baseline based on energy or fuel used during the project, and using a kitchen performance test (which involves physically weighing the amount of fuel used for cooking over a three-day period during an in-kitchen test). Kitchen performance tests tend to be the most reliable, since they are evaluating local data. Project-specific baselines should be compared to local, peer-reviewed values within a buffer, as individual projects will always have some variability.

- Projects using a global default value or kitchen performance test are eligible.
- Any project-specific baselines must fall within 30% of peer-reviewed values.

Efficiency of project stove use

The thermal efficiency of the project stove refers to the portion of heat transferred to a cooking pot relative to the overall amount of energy generated during a combustion event. Since the thermal efficiency is based on a lab-based test, stoves are unlikely to perform at their rated efficiency in the real-world setting. Therefore, projects that employ a project stove with a thermal efficiency at or below 25% efficiency risk achieving no real emission reductions at all. The most up-to-date methodologies no longer allow efficiency rates below 25% for this reason.

- Project stove efficiency must be greater than 25%.

CRITERIA

Cookstoves

Wood-to-charcoal conversion factor

The wood-to-charcoal conversion factor expresses the units of firewood that are needed to produce one unit of charcoal. The conversion factor is impacted by the density of the wood used, its moisture content, and the efficiency of the kiln used.

Historically, the firewood-charcoal conversion default proposed under the CDM was 6 kg wood / kg charcoal. This has recently been adjusted to be more conservative by assuming a default factor of 4 kilograms of wood / kg charcoal. A 2023 UNFCCC's study found the conversion factors can range from 4–19.6 kilograms of wood / kg charcoal. This more substantial variation is a result of the charcoal production technique, the type of kiln used, the moisture content of the wood, weather conditions at the time of production, and other factors. In order to remain conservative, Patch will exclude working with these higher-end conversion factors.

- Patch requires projects to have a wood to charcoal conversion factor of 4kg wood / kg charcoal or below. Alternatively, projects can opt to use a direct charcoal emission factor of 197.15 tCO₂/TJ or lower.
- Projects using direct charcoal emission factors that account for wood to charcoal conversion are automatically eligible.

Share of project devices in use

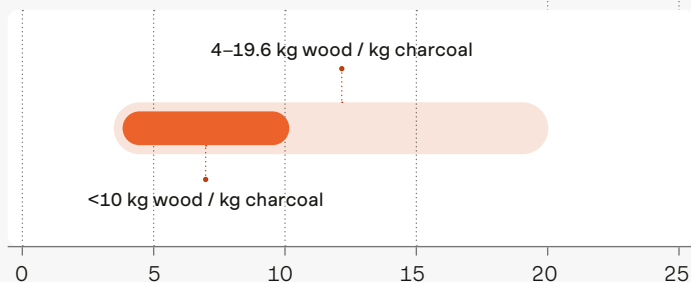
A cookstove project can only be successful in reducing emissions if the project device is used. Therefore, projects need to monitor how much the project stove is used, and to what extent the baseline stove is displaced. Project use can be interpreted using direct testing as well as surveying. While the share of project devices in use is an important parameter in the calculation of emission reductions, there is no approach of judging whether a surveyed parameter applied is reasonable.

- If the criterion is monitored through a stove use monitor or direct metering (e.g. for electric stoves), or if the project fuel is tracked (e.g. through fuel sales of bioethanol), then this project may proceed through Patch's review process.
- If the criterion is monitored via survey, Patch will record the usage rate applied in each year but will not use this variable as a filtering criterion for eligibility.

Claims that exceed a 95% usage rate by the end of the second year of operation will be carefully considered on a case-by-case basis, since these projects are at risk of overinflating their impact.

Recommended wood to charcoal conversion factor (kg)

- Range found by UNFCCC study (2023)
- Patch requirement (when at least half of fuel comes from charcoal)



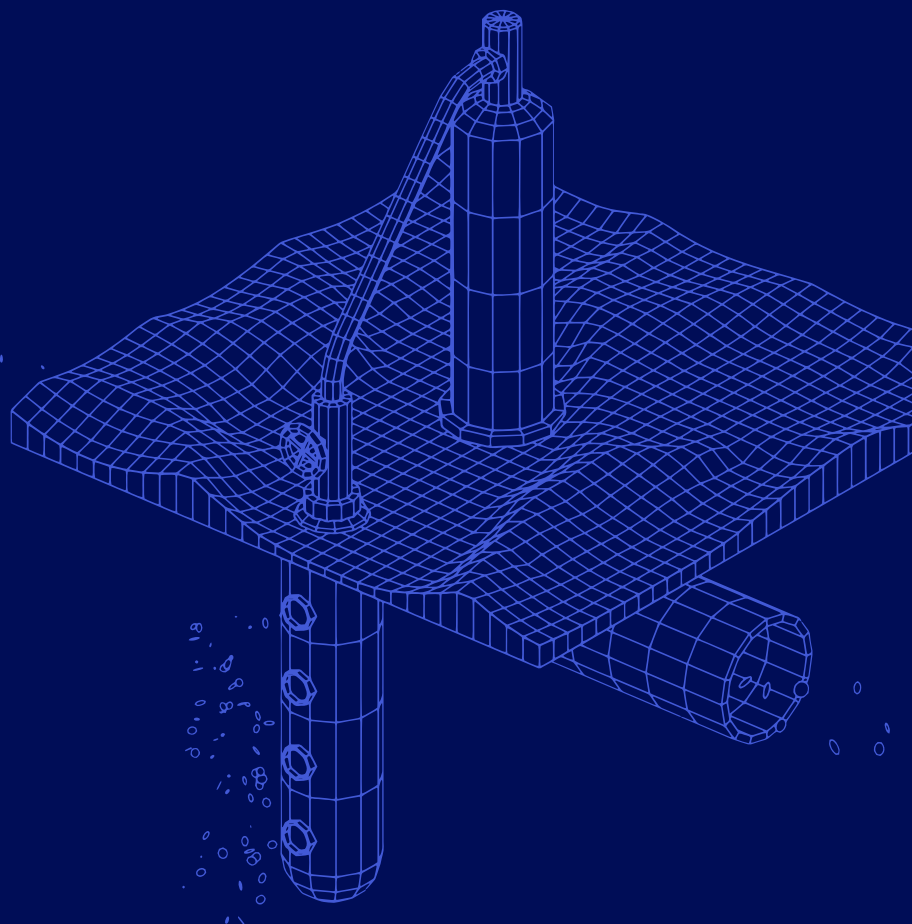
Landfill gas

Landfill gas projects capture methane before it is released into the atmosphere and either flare it or use it to generate electricity. After waste is deposited in landfills, organic material decomposes to create landfill gas. If the right infrastructure and systems are put in place at waste sites, the methane can be captured and converted into energy to generate electricity or heat.

Flaring only projects reduce methane emissions from escaping landfills.

Flaring and electricity projects reduce methane emissions and displace fossil fuel grid electricity.

Flaring and electricity projects will undergo a deeper diligence process since projects are more complex and there are more potential sources of income that can impact a project's additionality.



CRITERIA

Landfill gas

Evaluation of legal incentives

A project's legal context is one of the most important indicators of its additionality. Increasingly, governments are seeking to reduce the emissions coming from landfill sites as part of wider environmental strategies. In the extreme, these policies may mandate the implementation of certain activities, therefore making any carbon credit claims un-additional (assuming appropriate policy enforcement). Other policies may exist that do not mandate an activity, but still incentivize it, and therefore may influence a project to go ahead even without carbon credits.

Every Patch-listed project must demonstrate that it has low legal incentives in order to be eligible for review by demonstrating a presence of no more than one of the following incentives:

- Jurisdictional technical assistance or training programs for execution of landfill gas projects that reduce barriers to implementation
- Tax credits
- Grants and funding support
- Feed-in tariffs for electricity produced from landfill gas sites
- Direct mandates for all landfills to control methane emissions, or mandates just for large landfills

Project screening variables

On average, projects that are smaller-scale and located in a United Nations Least Developed Country (LDC) will face significantly higher barriers to implementation without credit revenues. For example, access to financing and technological know-how will be more limited for these types of projects.

Projects will be eligible if they meet one of the following conditions:

- The project is a flaring only project
- The project is a small-scale flaring and electricity project (<15MW)
- The project is a flaring and electricity project based in an LDC

All additional projects will need to undergo subsequent review based on the remaining criteria.

Proportion of revenue from carbon credits

Projects that would have been profitable without carbon credits using alternative revenue sources or incentives act as key additionality risks. Flaring and electricity projects typically generate electricity that represents ~80% of total revenue, with carbon credits representing under 20% of total project revenues on average. Overall, the importance of carbon credit revenues for this project type is, on average, much more significant than it is for renewable energy projects (where it's more standard for less than 5% of revenues to come from carbon credits).

Patch intends to set a high bar for financial additionality of landfill gas projects. If carbon credits represent over 25% of project revenue, this is a good demonstration that the project is only financially viable because of carbon credits.

$$\frac{\text{\% of Revenue from Carbon Credits}}{\text{Carbon Credit Revenue}} = \frac{\text{Carbon Credit Revenue}}{\text{Total Revenue (Carbon Credit Revenue + Electricity Revenue)}}$$

Patch will calculate data on expected / actual annual electricity generation, expected carbon credit issuance, electricity tariff price, expected credit issuances, and average carbon credit price to evaluate carbon credit and electricity revenues.

- Credit revenues must exceed 25% of total project revenues for a project to be eligible.

Conservativeness regarding electricity generation

For flaring and electricity projects, the impact of displaced electricity can represent a significant proportion of the total emission reduction from landfill gas utilization projects. Projects that exclude this source of emissions impact from their calculations can therefore significantly under-estimate their overall emissions impact.

- Projects that exclude the impact of displaced electricity are eligible.
- Projects that do not exclude displaced electricity must be reviewed against the three subsequent variables.



CRITERIA

Landfill gas

Global warming potential of methane

To convert the emissions impact of avoided methane into a CO₂ value, projects use an estimate of the global warming potential (GWP) of methane from the most recent IPCC assessment reports. As these values are updated regularly, the use of a low GWP figure may lead to an under-estimation of the project's emission impact. GWP will likely reflect the year a project was first registered, and is unlikely to be updated in subsequent crediting periods.

The current IPCC GWP for methane is 28. Projects using lower GWPs for methane will underestimate the project's emissions impact.

Accuracy of electricity grid emissions factors

Emissions factors (EFs) convert activities into associated emissions (such as converting grid electricity use into emissions). If a flaring and electricity project displaces grid electricity, the emissions factor used by the project should broadly resemble the emission factor of the grid that the project is a part of. Projects that use an emission factor significantly higher than that of the grid are likely over-estimating this displacement impact.

- Project EFs must not be more than two times greater than published, third-party verified EFs from national datasets or global sources.

This higher threshold is used to allow the assessment to be conducted in a more binary way, and to account for individual project contexts that may justify a slightly higher combined margin emission factor than that represented by the grid currently.

Oxidation factor

Methane generated in a landfill site's interior passes through a topsoil layer before being released into the atmosphere. For landfills not covered by a synthetic layer, as methane passes through the topsoil layer, the methane will be partly oxidized to carbon dioxide by microorganisms. The avoided methane impact therefore depends on the amount of methane generated and on how much would have been oxidized in the topsoil. Projects that under-estimate the amount of oxidation that would have occurred will overestimate the avoided methane compared to the baseline scenario.

Some projects choose to apply an oxidation discount rate when not using a synthetic cover to mitigate this potential for overestimation. While different standards have different requirements for oxidation discount rates, common rates fall within 10–35%.

- Projects must include a synthetic layer, or apply an oxidation discount rate of at least 10% (IPCC default value) to emissions calculations to account for this impact.



Renewable energy

Renewable energy projects were first popular as a mechanism for growing the renewables industry when implementation was low. As adoption grows, there are increasing subsidies and other incentives in place that reduce additionality of new projects. However, credit financing can still have a huge impact for small-scale, off-grid projects in developing countries where adoption rates are low. Therefore, Patch's integrity criteria focus heavily on project size and location, market penetration rates, and how credit revenues contribute to project success.





CRITERIA

Renewable energy

Project scale and country screeners

On average, projects that are smaller-scale and located in a United Nations Least Developed Country (LDC) will face significantly higher financial barriers to implementing the project without carbon credits.

Furthermore, the extent to which a project is already common practice in that country is also highly dependent on its subtype, scale, and country. Offshore wind and organic waste projects, micro-scale projects, and renewable technologies in LDCs are significantly less popular than other types of renewable energy. Therefore, presence of one of these characteristics indicates higher inherent additionality.

Verra and Gold Standard have existing policies in place that require projects to be small-scale, based in an LDC or in locations where penetration is lower than 5% for a given subtype. But many of these projects are still identified as higher risk by external ratings organizations. Adopting a set of project screening variables and a lower adoption threshold (see next criterion) can minimize this risk and ensure Patch is selecting best-in-class renewable energy projects.

For a project to proceed to further review, it must meet one of the following conditions:

- Small-scale (<15MW) or micro-scale (<5MW)
- Non-grid connected
- Based in an LDC
- Offshore wind or organic waste
- Additionally, all projects must have completed an environmental impact assessment to be considered for further review

Common practice / market penetration

This is defined as the penetration of the renewable energy subtype within that country on the date in which the project started. If an activity was already common practice within a region at the time a project started, then it suggests that its activities could have been implemented without carbon credits. Higher penetration of the project's activity in that region indicates higher common practice and higher additionality risks.

However, adoption rate can be seen as a lagging indicator, as it can take a few years to build a power plant, so the rate of growth in new projects tends to vastly exceed adoption rates. Given how the renewable energy industry has scaled, Patch believes this 5% cutoff is high for most renewable energy technologies, especially wind and solar, and has elected to implement a more stringent adoption rate to focus on truly emerging markets.

- Market penetration for a given subtype must be less than 2% in the year the project was registered.

Proportion of revenues from carbon credits

Projects that would have been profitable without carbon credits are not additional. It is therefore important to evaluate the importance of carbon credits to the revenue mix of the project. Across renewable energy sub-types, it is standard for between 3% and ~10% of project revenues to come from the sale of carbon credits. This proportion tends to be lowest for solar and hydro projects, and highest for small-scale and bioenergy projects.

Patch intends to set a high bar for financial additionality of renewable energy projects. If carbon credits represent *less than 10% of project revenues*, then the project may have been financially viable even without credits.

% of Revenue
from
Carbon Credits

=

Carbon Credit Revenue
Total Revenue
(Carbon Credit Revenue + Electricity Revenue)

Patch will calculate data on expected / actual annual electricity generation, expected carbon credit issuance, electricity tariff price, expected credit issuances, and average carbon credit price to evaluate carbon credit and electricity revenues.

- Credit revenues must exceed 10% of total project revenues for a project to be eligible.



CRITERIA

Renewable energy

Accuracy of electricity grid emissions factors

Emissions factors convert activities into associated emissions (such as converting grid electricity use into emissions). Given that renewable energy projects are displacing grid electricity, the emission factor used by the project should broadly resemble the emission factor of the grid that it is a part of. Patch will compare a project's emissions factors to published emissions factors for a project's region.

Given the variety in individual project use cases, it is standard for project-specific emissions factors to fall within twice their national third-party benchmarks. Any project that uses an emission factor significantly higher than that of the grid is likely overestimating this displacement impact.

- Project emissions factors must not be two times higher than the third-party benchmarks.

Sourcing and integrity variables

Biogas can be created using a range of different organic feedstocks. Because of the wide variety of options, the impact of a biogas feedstock on the ecosystem can also vary. For example, burning or decomposition of crop waste can be a net source of emissions if not managed. Alternatively, purpose-grown crops (crops with an alternative purpose, such as feedstock for animals) are at high risk for creating economic leakage, land use change, and additional resource consumption if applied to a biogas project.

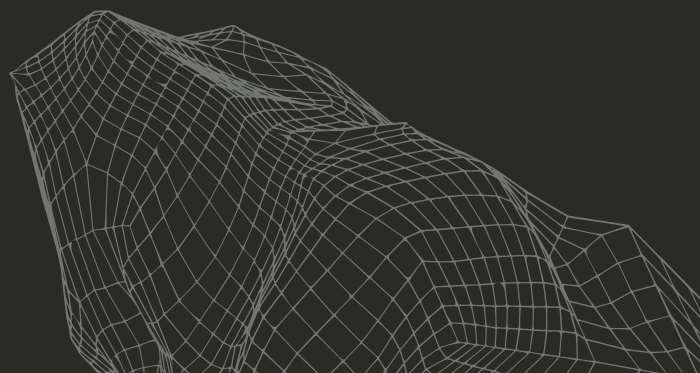
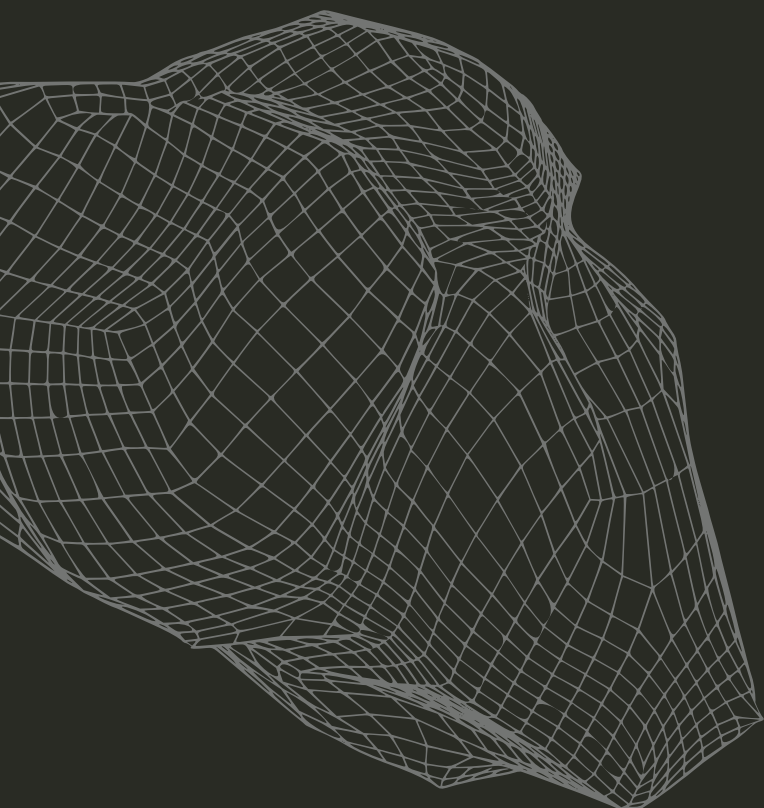
- Projects using feedstock from wood and crop waste are eligible.
- Alternative sources of feedstock may apply to be considered case by case. These projects will need to provide a thorough assessment of:
 - » Sustainability and scalability of the feedstock
 - » Proof that feedstock will not impact biodiversity or food production
 - » Testing to demonstrate feedstock is not contaminated

Biochar

Biochar is a solid product generated from biomass through pyrolysis, i.e., the exposure of biomass to high temperatures with no or limited access to oxygen. Biochar sequestration is a form of biomass-based carbon dioxide removal (CDR) that partially converts biomass into biochar that is stable for decades or centuries. Biochar has a range of uses. Most commonly, it can be used as an additive to agricultural fields to enhance yields, but may also be used as filler for concrete, roofing material, and enhancements for cattle feed.

Industrial-scale projects use automated pyrolyzers or gasifiers that can continuously produce biochar. These projects tend to be the most efficient at capturing gases produced during the pyrolysis process, but may have higher emissions associated with transportation of biochar.

Smaller scale artisanal projects rely on using open fires or kilns to create small batches of biochar. There are greater process-level emissions associated with artisanal projects because it's much harder to capture all gas created during pyrolysis. But these projects create economic opportunities for small communities and can be installed directly at farms.



CRITERIA

Biochar

Biomass sourcing and integrity variables

Biochar can be produced through pyrolysis of nearly any organic material. Because of the wide variety of options, the impact of a biochar feedstock on the ecosystem can also vary. For example, burning or decomposition of crop waste can be a net source of emissions if not managed, so using crop waste as a source of feedstock can help reduce these emissions.

Alternatively, purpose-grown crops (crops with an alternative purpose, such as feedstock for animals) are at high risk for creating economic leakage, land use change, and additional resource consumption if applied to a biochar project. Puro.Earth and Verra require feedstock baselines to be set at zero, meaning the project is conservatively not accounting for emissions caused by the decay of feedstock.

Woody biomass

Projects using woody biomass should:

- Not source biomass from primary or old-growth forests.
- Prefer residues or byproducts from forest-fire management, forest-health activities, or existing managed plantations.
- Not rely on new plantations established primarily to produce biomass for bioenergy or CDR.
- Demonstrate that forest carbon stocks are stable or increasing over time.
- Where trees or vegetation are removed, conduct replanting or demonstrate and monitor that local carbon stocks are maintained or increased.
- Avoid creating incentives for additional wood production or diverting wood from existing energy uses. Any unavoidable secondary impacts should be conservatively quantified and mitigated.

Agricultural biomass

Projects using agricultural biomass should:

- Use agricultural residues or waste rather than dedicated energy crops that compete with food or energy production, such as corn grown for ethanol.
- For retrofits using waste from energy-crop production, source the waste from existing farming operations certified under RSB, ISCC, or EU RED II.
- Demonstrate that the waste's carbon would otherwise be released rapidly into the atmosphere, for example through burning or decomposition.
- Ensure that using the waste does not create secondary land-use impacts or divert it from an existing beneficial use.
- If secondary impacts cannot be avoided, conservatively account for and mitigate them.

Invasive-species biomass

Projects using biomass from invasive-species removal should:

- Demonstrate that removal improves or maintains local carbon stocks.
- Conduct replanting where appropriate, or monitor local carbon stocks to show that removal does not cause a net decline.
- Ensure that biomass removal does not create additional land-use impacts or incentivize further ecosystem disturbance.

CRITERIA

Biochar

Stability and chemical composition of biochar

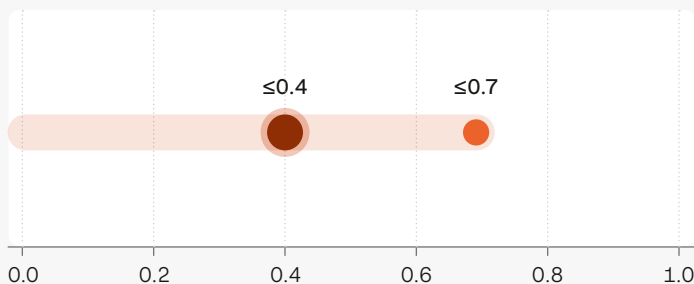
The stability of biochar depends on the underlying composition of the feedstock, particle size, and the conditions under which pyrolysis was performed. Higher temperatures during pyrolysis tend to create more stable biochar, because more volatile gases are lost throughout the process. However, lower temperatures create a biochar that is better suited to improving soil quality and may be preferential given the final application of the material. Some studies, such as Sanei et al., have found that temperatures in the range of 500°C can be a threshold for stability, but this can vary due to differences in biochar chemistry.¹

A project's hydrogen to carbon (H:C) ratio can also be a measure of stability. Many leading standards (European Biochar Certificate, Puro.Earth, and Verra) note that H:C ratios above 0.7 are considered unstable.

- Patch will collect data on where / how biochar is applied.
- H:C ratios must be lower than 0.7.
- Patch will note whether a project's H:C ratio is lower than 0.4, as that ratio has been demonstrated to sequester carbon for longer.
- Patch will collect data on a project's pyrolysis temperature to flag any potential for volatile components to be retained after the process.
- Projects with likelihood of volatile compounds must account for carbon losses through the establishment of a defined buffer pool.

Recommended hydrogen to carbon (H:C) ratio

- Upper limit recommended by leading standards
- Patch threshold for special recommendation



Quantification of project emissions

The application of biochar can serve as an additional emissions source or sink, depending on the composition of the biochar and where/how it is applied. It is critical that biochar application is included in a project's life cycle assessment (LCA) to ensure the project is a net removal of carbon. Process emissions will likely differ substantially between industrial and artisanal biochar projects. While industrial pyrolysis projects may have higher transportation or processing emissions, artisanal projects are more likely to lose heat or gases during the pyrolysis process. Project LCAs can be used to flag these important sources of emissions throughout the production process.

- Projects must complete a life cycle assessment that covers cradle to grave emissions.
- **Industrial Projects:** 100% of pyrolysis gases must be recovered or combusted and accounted for in a project's emissions inventory.
- **Artisanal Projects:** Projects must disclose percentage of heat and gas lost through pyrolysis and integrate those into life cycle assessments.
- Projects should only credit for removals associated with biochar production, and not for any use case emissions (e.g. soil amendment, concrete filler).
- Patch will note whether any particular aspects of biochar development are likely to lead to high process emissions, which reduces overall project efficiency.

By-products and financial additionality

Biochar projects create a range of potential byproducts that could potentially be sold to generate additional project revenue (such as syngas). Therefore, the additionality of a biochar project is dependent on understanding how the sales of these materials impact the underlying viability of the project.

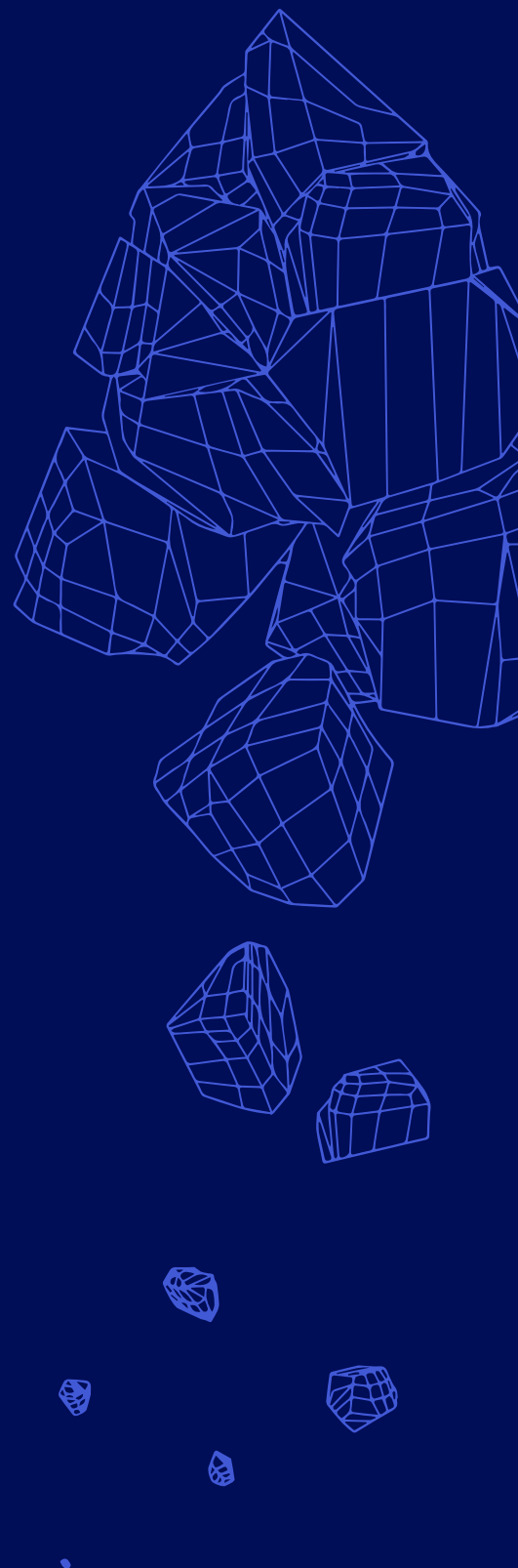
- Patch will collect data on whether a project is selling or donating created biochar.
- Projects must present a convincing argument for financial additionality that integrates revenue made from biochar, and any additional sold byproducts.

² Sanei, Hamed. "Assessing biochar's permanence: An inertinite benchmark." *International Journal of Coal Geology*, vol 281 January 2024, Science Direct, <https://www.sciencedirect.com/science/article/pii/S0166516223002276?via%3Dihub>.

Enhanced rock weathering

Enhanced rock weathering (ERW) sequestration builds on a naturally occurring process that captures CO₂ from the atmosphere and stores it in minerals. Reactive rocks may be deposited on farmlands, near water bodies, or directly in the ocean (which will not be covered in this particular overview). The location of deposition, environmental conditions, and rock chemistry all have an impact on the rate of weathering and overall carbon benefit of the project. This means that quantification and review of ERW projects can vary substantially based on the material source and local environmental conditions.

ERW projects are still fairly new, and as a result, long-term impacts are untested. The level of scrutiny to date is quite modest compared to what is likely to come. Even among leading standards (Puro.Earth, CSI, Isometric) there is significant variability in terms of locations allowed, usable feedstocks, baselining requirements, and other criteria for projects. As a new removal technology, the most critical risks will relate to the chemistry of their feedstock, how they measure, monitor, and model capture and storage, their agricultural impacts, and emissions from their entire supply chain.



CRITERIA

Enhanced rock weathering

Feedstock chemistry and source

The two most important feedstock criteria are chemistry and source.

- **Chemistry:** Feedstocks can come from a variety of rocks or minerals rich in calcium, magnesium, and iron. Common feedstocks include olivine, basalt, and wollastonite. Different rocks and minerals will have varying grain sizes and chemical compositions, which impact ideal application setting as well as longer-term mineralization rates and potential.
- **Source:** Feedstock can be obtained from a range of sources including treated/untreated mine tailings, dedicated mines, industrial waste streams, all of which have varying risks and benefits. Mined rock can be the most mineralogically consistent, but is at highest risk for creating additional adverse sustainability impacts. If that mined rock had an alternative purpose at its origin, the project will have a higher risk of leakage if additional mining is needed to fill a resource void created by project activities.

On the other hand, feedstock from mine tailings or industrial waste can be more mineralogically variable, and have a higher risk of heavy metal contamination. Mineralogical variability can impact weathering rates, which affects the ability to predict long-term carbon storage with certainty.

- Patch will collect information on the chemistry and source of the feedstock.
- If using mine tailings or waste materials:
 - » Projects must assess feedstock for contaminants.
 - » Projects must assess mineralogical variability within feedstock.
- Projects that rely on dedicated mines are not eligible.
- The project must make a convincing argument that the feedstock does not contribute to economic / market leakage.

Reaction with environment

Rock type, grain size, temperature, moisture, soil pH, and energy input will all impact mineralization rates and removal capacity at the project location. Therefore, optimizing a specific project's weathering conditions will depend on studying how a material will respond with its environment. Sites with a warm and humid climate tend to be optimal for mineralization, which makes certain locations (including Central America, India, and Brazil) ideal candidates for ERW projects.

- The project must describe the process for evaluating soil suitability and weathering rates.
- The project must conduct in situ testing or rely on local, validated studies to determine how variables like soil moisture, pH, and local vegetation impact long-term mineralization rates and durability.
- The project must account for potential sources of carbon losses over the project's lifespan.

Monitoring plan

The most significant area of uncertainty for ERW projects is the estimation of CO₂ uptake and the definition of the reservoir boundaries. Due to the cost of in situ data collection, most early-stage ERW projects rely on modeling to project out future impact and removals. This includes modeling of dissolution rates as well as modeling of material movement (dissolved carbon will, over time, transport into water bodies where additional chemical reactions can take place).

A strong reliance on models will increase uncertainty in a project's outcomes. Monitoring on site and supplementing monitoring work with physical data collection will help ground truth the model assumptions and results. Due to the variability in removal rates due to rock type and grain size, climate, soils, and agricultural practices, average values are likely to be erroneous. This suggests that each site location would need its own data collection to validate models.

CRITERIA

Enhanced rock weathering

Ex-ante projections can be data-driven using site specific environmental information or rely on average values. Relying on average, non-specific values will be considered high-risk given the high variability of ERW performance even for sites in similar climatic conditions. Periodic verification of projections through site specific data collection would reduce the risk of non-performance.

- Patch will collect information on a project's full monitoring plan.
 - » Models / counterfactuals must be grounded in actual / local data.
 - » Patch will collect data on how project boundaries are defined and ensure project accounting methods factor in all immediate water reservoirs into project boundaries.
- Ex-ante credits must rely on data-driven, site specific projections. These projections must continue to be periodically validated using site-specific data collection over time.

Measurement and application

While all project emissions will be captured within a project's life cycle assessment, the complexity of a project's supply chain can be a real source of risk that can impact project success and long-term options. Additionally, the more emissions intensive a new project is, the harder it will be for that project to scale and remain viable over time. While all emissions listed below must be integrated within crediting, a more emissions-intensive process impacts project efficiency, which can create risks for long-term scalability and project viability for a project type that is already constrained due to costs associated with measuring and monitoring testing locations and carbon uptake over time.

- Patch will collect information on the process for collecting, processing, transporting and applying feedstock.
- A project's life cycle assessment (LCA) must integrate emissions associated with feedstock procurement, rock grinding / preparation, transportation, post-processing, and application.
- **Agriculture Projects:** LCAs should consider impacts (positive or negative) to local crops and ensure that process emissions are included in LCA, but that they do not impact crediting.

Engineered capture and storage

Engineered capture and storage refers to the wide variety of technological approaches to capturing carbon from the atmosphere and storing that carbon somewhere where it won't leak. There are many emerging strategies for both capturing and storing carbon that won't be covered in depth here. As this market matures, Patch will iterate on our process to increase our depth of assessment for each of these different strategies.

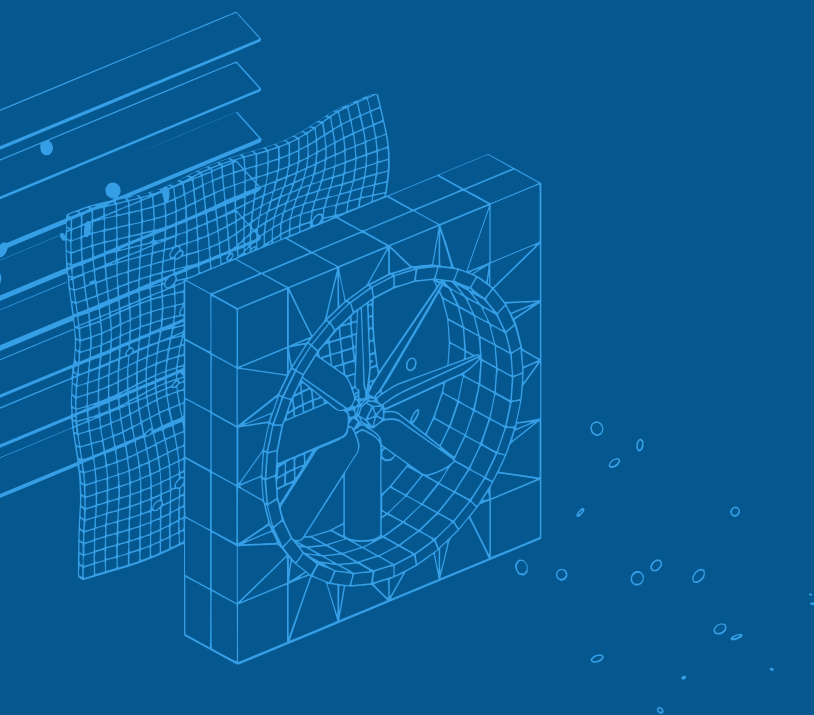
Engineered capture is appealing because it has the largest storage scale potential out of all removal methods, but it is also incredibly costly to develop and scale. At this stage, many risks of engineered capture are focused around untested technology and application.

Engineered capture

- **Point source capture (PSC):** The capture of CO₂ from incoming gas or combustion exhaust from industrial processes including fossil fuel production, glass fabrication, and steel furnace combustion. These are typically avoided emissions projects that prevent additional emissions from entering the atmosphere.
- **Direct air capture (DAC):** The process of using equipment and chemical processes (such as mechanical fans, natural forces like wind, or sorbents and solvents) to remove CO₂ directly from the air.

Storage

This is the process of storing captured carbon in the ground or another stable material. The means of storage is independent of the collection method. Storage options often include depleted oil and gas wells (on land or offshore), injection into rock formations, and mineralization (in rock or materials like concrete). All these reservoirs are likely to be considered permanent on geological timescales after a period of monitoring.



CRITERIA

Engineered capture and storage

Projects optimizing extractive processes

Certain PSC projects aim to capture emissions directly from fossil power plants. Enhanced Oil Recovery (EOR) is a storage mechanism for direct air capture where CO₂ is pumped into oil wells, enhancing the efficiency of oil extraction. While these processes can reduce the carbon intensity of oil extraction, they may also incentivize future oil extraction by making processes more efficient.

- Point source capture projects supporting fossil power plants will be ineligible.
- Projects using enhanced oil recovery will be ineligible.

Complexity and life cycle assessment

While many nature-focused engineered projects like biochar and enhanced rock weathering projects have the complexity of uncertainty in their chemistry, engineered solutions have the complexity of equipment, supply chain, operating personnel, and similar variables. Simpler project designs tend to have less risks and uncertainty.

Projects may choose to quantify stored carbon only, regardless of the source. It is more complicated to account for net removal, tracing emissions in the operations, transport, and possibly throughout the supply chain. This approach is more complicated because it requires multiple variables and data types, but is more likely to lead to real, net-negative impact.

Additionally, engineered capture can be counterproductive if the process requires more fossil carbon than it can sequester. Projects that rely on energy from the grid (even intermittently, when renewable energy isn't available), may not generate negative emissions overall.

- Life cycle assessments (LCAs) and crediting must cover cradle-to-grave emissions. If independent organizations are covering carbon capture and carbon storage, the collaborative effort must collectively cover cradle-to-grave emissions.
- Projects must have stable access to a renewable energy source.
- Projects must share how various process emissions are integrated into crediting.

Storage durability

Durability of the storage is entirely dependent on the reservoir, but storage within depleted oil and gas wells, saline aquifers, and mineralization in basalts is understood to be stable over thousands to millions of years. Although storage in concrete is likely to remain contained for millions of years, the concrete is a product with an end of life that may impact durability.

The highest risk to high-durability storage is the potential for gas to leak from the storage site. Other storage risks tend to be uncommon and location specific. For example, volcanic activity is the biggest risk for storage in a basalt reservoir, where engineering failure is the greatest risk for storage in an abandoned oil and gas well.

- Projects must employ a thorough MRV process to validate gases injected, and rate of gas leakage, to ensure loss of CO₂ is known.
- Projects must share each basin's storage capacity and the capacity used.
- The project's storage option must share a comprehensive and validated study for durability including an assessment of any risks of reversal.
- Projects must demonstrate how they comply with local regulations.

BiCRS

Biomass with carbon removal and storage (BiCRS) projects represent the full range of projects where different forms of biomass are processed, then stored or sequestered to remove the carbon over geologic timescales. BiCRS projects can utilize different forms of biomass, different forms of processing, and different forms of storage. But the ultimate goal is to prioritize long-term carbon removals. Because these projects have overlapping elements with both biochar projects and the storage components of engineered capture and storage projects, these frameworks will represent a fusion of those two assessment frameworks.



CRITERIA

Biomass with carbon removal and storage (BiCRS)

Biomass sourcing and integrity variables

Different sources of biomass feedstock can create different net ecosystem risks or benefits. For example, burning or decomposition of crop waste can be a net source of emissions if not managed, so utilizing crop waste as a source of feedstock can help reduce these emissions.

Alternatively, purpose-grown crops (crops with an alternative purpose, such as feedstock for animals) are at high risk for creating economic leakage, land use change, and additional resource consumption if used as a biomass feedstock.

- Projects using feedstock from wood and crop waste are eligible.
- Alternative sources of feedstock may apply to be considered case by case. These projects will need to provide a thorough assessment of:
 - » Sustainability and scalability of the feedstock.
 - » Proof that feedstock will not impact biodiversity or food production.
 - » Testing to demonstrate feedstock is not contaminated.
- Projects may not use feedstock from long-lived biomass (standing, mature forests).
- Purpose-grown crops are eligible as long as the CDR facility is a retrofit and the most likely counterfactual would be continued biomass usage.
- Patch will report on whether the feedstock emissions baseline is set at zero.

Biomass with carbon removal and storage (BiCRS)

Biomass with carbon removal and storage projects process biomass and then store or sequester the resulting carbon over geologic timescales. Because these projects combine elements of biochar and engineered capture and storage, their integrity depends on both the source of the biomass and the durability of the storage pathway.

Patch evaluates feedstock sourcing, lifecycle emissions, leakage, regulatory compliance, storage durability, and the project's broader contribution to net carbon removal.

Biomass sourcing and integrity

Woody biomass

Projects using woody biomass should:

- Not source biomass from primary or old-growth forests.
- Prefer residues or byproducts from forest-fire management, forest-health activities, or existing managed plantations.
- Not rely on new plantations established primarily to produce biomass for bioenergy or CDR.
- Demonstrate that forest carbon stocks are stable or increasing over time.
- Where trees or vegetation are removed, conduct replanting or demonstrate and monitor that local carbon stocks are maintained or increased.
- Avoid creating incentives for additional wood production or diverting wood from existing energy uses. Any unavoidable secondary impacts should be conservatively quantified and mitigated.

Agricultural biomass

Projects using agricultural biomass should:

- Use agricultural residues or waste rather than dedicated energy crops that compete with food or energy production, such as corn grown for ethanol.
- For retrofits using waste from energy-crop production, source the waste from existing farming operations certified under RSB, ISCC, or EU RED II.
- Demonstrate that the waste's carbon would otherwise be released rapidly into the atmosphere, for example through burning or decomposition.
- Ensure that using the waste does not create secondary land-use impacts or divert it from an existing beneficial use.
- If secondary impacts cannot be avoided, conservatively account for and mitigate them.

CRITERIA

Biomass with carbon removal and storage (BiCRS)

Invasive-species biomass

Projects using biomass from invasive-species removal should:

- Demonstrate that removal improves or maintains local carbon stocks.
- Conduct replanting where appropriate, or monitor local carbon stocks to show that removal does not cause a net decline.
- Ensure that biomass removal does not create additional land-use impacts or incentivize further ecosystem disturbance.

Regulatory compliance

Projects must demonstrate compliance with applicable local regulations and environmental assurances.

Lifecycle emissions and project complexity

BiCRS projects may quantify stored carbon alone, or may account for net removal by tracing emissions across project operations, transport, and, where relevant, the wider supply chain. Net-removal accounting requires more data and introduces more sources of uncertainty, but it provides a clearer assessment of the project's actual climate impact. Projects that rely on fossil-intensive energy may not generate net-negative emissions overall.

- Lifecycle assessments and crediting must cover emissions from cradle to grave. Where separate organizations are responsible for carbon capture and carbon storage, the combined assessment must cover the full lifecycle.
- Patch scrutinizes projects that amortize emissions over an assumed operating life of more than 30 years. These projects must provide evidence that the equipment was designed to operate for that period. If the project cannot demonstrate that the equipment can achieve the assumed lifespan, it is not eligible.
- Projects must clearly explain how process emissions are incorporated into crediting.

Storage durability

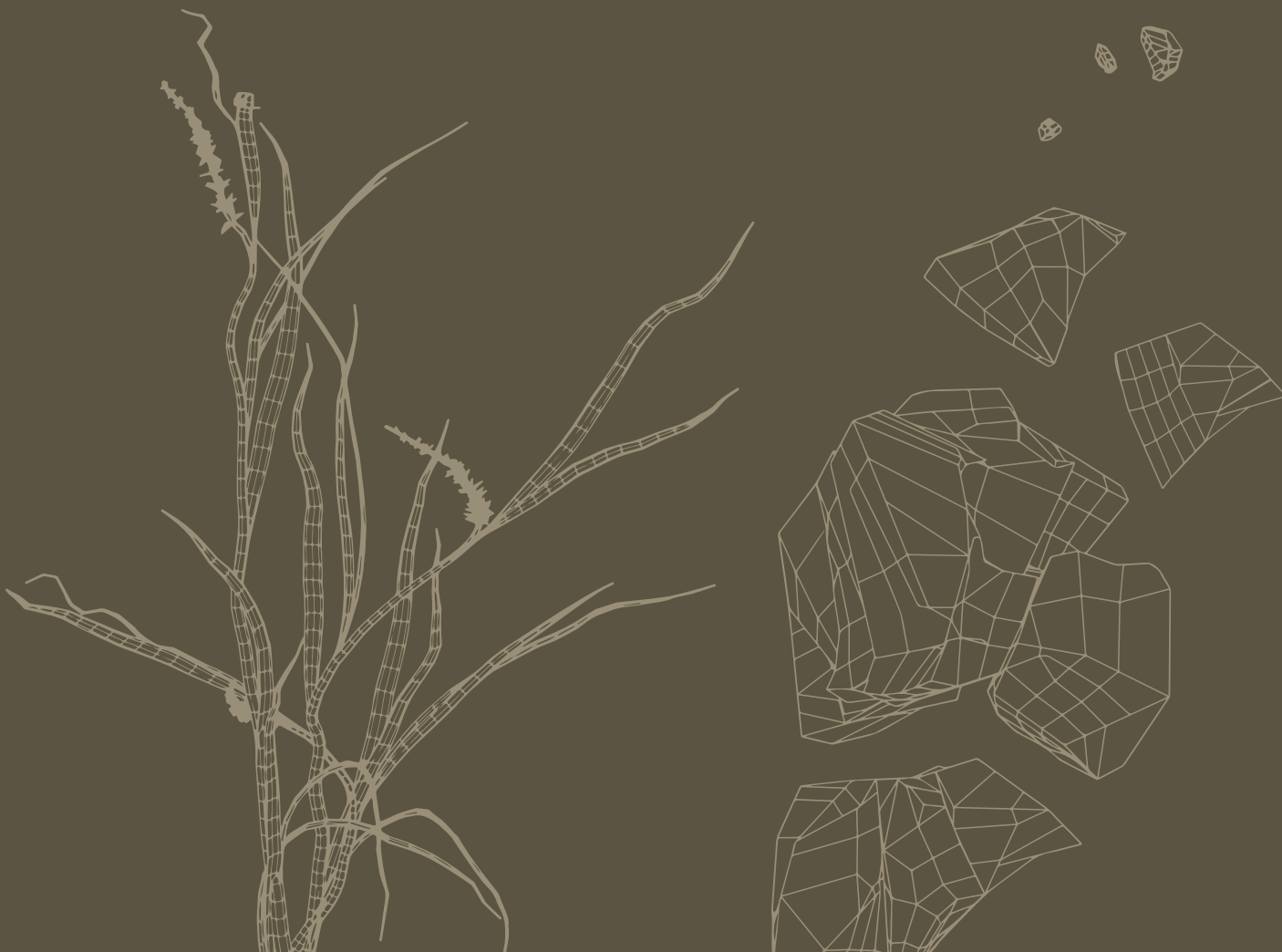
Storage durability depends on the reservoir and the risks associated with the storage pathway. Depleted oil and gas wells, saline aquifers, and mineralization in basalt can provide storage that remains stable for thousands to millions of years. Other pathways may require additional scrutiny, including storage in products whose end-of-life treatment could affect durability.

Projects must:

- Use a thorough monitoring, reporting, and verification process to validate the quantity of gas injected and measure leakage from the storage site.
- Disclose the storage capacity of each basin and the capacity used by the project.
- Provide a comprehensive, validated assessment of storage durability, including potential reversal risks.
- Assess how anthropogenic, climatic, geological, and hydrological factors affect storage risk.
- Demonstrate, through methodological or regulatory compliance, that the project will not harm watersheds or soil health.
- For forward-crediting structures, implement financial and legal instruments that support long-term monitoring at the storage site.

Ethanol BECCS

Ethanol BECCS projects capture the biogenic carbon dioxide produced during corn fermentation and inject it into deep geological reservoirs. The pathway can deliver durable carbon removal, but it carries additional risks because it relies on purpose-grown crops, has upstream agricultural emissions, and may generate several environmental attribute certificates from the same facility.





CRITERIA

Ethanol BECCS

Ethanol BECCS projects are assessed differently depending on whether they are:

- **Retrofit projects**, where CCS is added to an existing, independently operating ethanol facility.
- **Net-new projects**, where ethanol production and CCS are developed as an integrated facility.

Disclosure of environmental attribute certificates

Ethanol facilities may participate in several certificate programs at the same time, including compliance carbon markets, Sustainable Aviation Fuel certificates, Renewable Fuel Standard credits, Low Carbon Fuel Standard credits, and voluntary carbon programs.

- Projects must provide an explicit list of all environmental attribute certificate programs in which the facility participates or intends to participate. The disclosure must cover compliance programs, fuel-sector certificates, and other voluntary carbon programs.
- Projects must also demonstrate that the carbon removal credits do not involve double counting.
- Projects that fail to disclose their participation in other environmental attribute programs are not eligible.

Feedstock sustainability and indirect land-use change

Ethanol facilities must use feedstock certified under the Roundtable on Sustainable Biomaterials, International Sustainability and Carbon Certification, or a standard of equivalent rigor. These certifications address issues including indirect land-use change, land history, social impacts, and soil and water health.

- Retrofit projects meet the indirect land-use change requirement through the sustainability certification. Because the project boundary is limited to the CCS retrofit, the farm-to-tank supply chain falls outside the retrofit's lifecycle assessment boundary.
- Net-new projects must account for indirect land-use change emissions in their lifecycle assessment. They may use a facility-level model, such as GREET, or standard deductions recognized under the applicable sustainability standard.
- Projects that follow the EU RED II directive are eligible where the directive's certification requirements are met.
- Projects with uncertified feedstock, or net-new projects that do not account for indirect land-use change, are not eligible.

CRITERIA

Ethanol BECCS

Lifecycle boundary and net carbon negativity

For retrofit projects, the lifecycle assessment may be limited to the CCS activity itself. The assessment must cover carbon dioxide capture, compression, on-site energy used by the capture unit, transport to the storage site, and geological injection. Upstream agricultural emissions and facility-wide process emissions do not need to be included where the pre-existing ethanol facility establishes a clear counterfactual.

The retrofit activity must store more carbon than it emits. If the CCS retrofit is net-emitting, the project is not eligible.

For net-new integrated facilities, the lifecycle assessment must cover the full farm-to-tank system, including:

- Agricultural inputs and feedstock cultivation
- Feedstock transport
- Fermentation and on-site energy use
- Carbon dioxide capture and compression
- Transport to the storage site
- Geological injection and storage

The full facility must be net carbon negative before any avoided fossil fuel emissions from ethanol displacing gasoline are counted. If upstream agricultural emissions are excluded from the assessment, the project is not eligible. Any displacement benefit may be reported separately for additional context, but it does not determine the Foundational Integrity Review outcome.

Projects must clearly document their lifecycle assessment methodology, system boundary, and key assumptions. Unclear or incomplete accounting requires further review before the project can pass.

Retrofit operating history and production volumes

For retrofit projects, additionality depends on the ethanol facility operating independently before the CCS investment. The facility must have operated for at least five years before the CCS project is registered.

Projects must also demonstrate that CCS revenue will not finance or incentivize an increase in ethanol production volumes. Increased production could create additional agricultural and process emissions outside the retrofit's narrow lifecycle boundary.

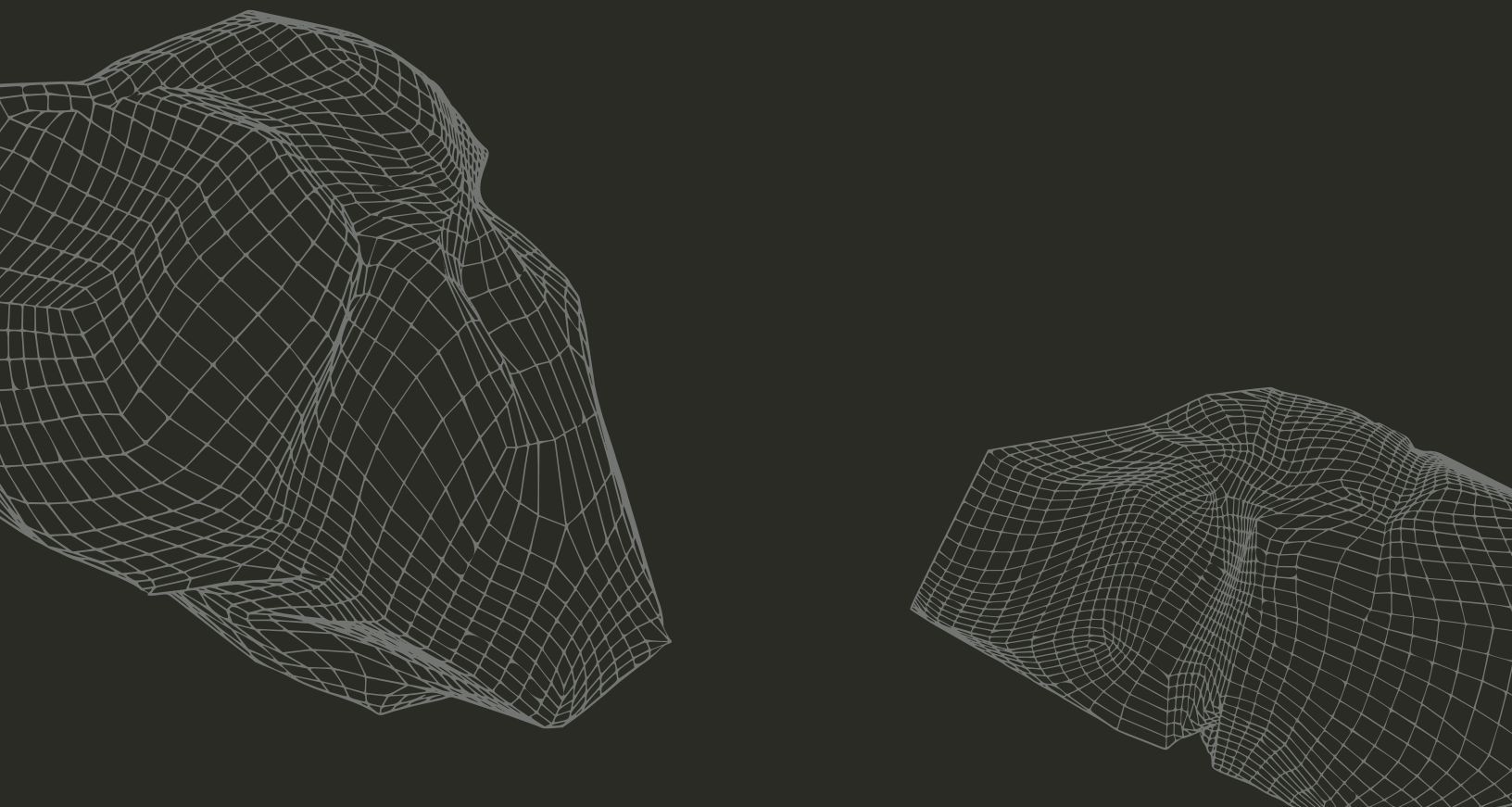
If the project is linked to an expansion in ethanol production capacity or volumes, it is not eligible.

Storage durability

BECCS projects must also meet the storage durability requirements described in the Engineered Capture and Storage section above. This includes validated monitoring of injected gases and leakage, disclosure of storage capacity and utilization, a comprehensive assessment of durability and reversal risk, and analysis of anthropogenic, climatic, geological, and hydrological risks. Projects must also demonstrate that their storage pathway does not harm watersheds or soil health.

Early-stage projects

Early-stage projects are carbon removal or avoidance projects that have not yet completed validation or begun issuing credits. These projects have become increasingly attractive to buyers as a mechanism for securing forward supply in tight markets and supporting project development when it is most needed. However, pre-validation projects carry significantly higher risks than issuing projects, including uncertainty around methodology approval, validation timelines, and ultimate credit quality. Therefore, Patch's integrity review for early-stage projects focuses heavily on developer track record and capability, evidence of third-party validation or assessment, and contractual protections that ensure projects meet Patch's standards before delivery.





CRITERIA

Early-stage projects

Eligible projects

To be considered for early-stage acceptance, projects must demonstrate a credible pathway to meeting Patch's standard Foundational Integrity Review (FIR) at the time of credit issuance. This includes alignment with accepted methodologies, registries, and project types that Patch supports for projects issuing credits. Projects must be in pre-validation or pre-registration stages — once a project has completed validation and begun issuing credits, it is evaluated against our standard FIR rather than early-stage criteria. Patch reserves the right to exclude certain project types or geographies from early-stage acceptance based on heightened risk profiles, even if they would be acceptable as issuing projects.

Developer capacity and track record

Given the inherent risks in pre-validation projects, Patch places significant weight on the developer's demonstrated ability to successfully deliver carbon projects. A strong track record reduces execution risk and increases confidence that the project will progress through validation and begin issuing high-quality credits on schedule. Patch evaluates developer capability across several dimensions:

- **Prior project delivery:** Developer has successfully brought at least one project through validation and credit issuance, ideally using similar methodologies or project types
- **Technical expertise:** Development team demonstrates deep knowledge and experience of relevant methodologies, monitoring requirements, and registry processes
- **Financial capacity:** Developer shows adequate capitalization or committed funding to complete project development and validation
- **Operational transparency:** Developer maintains clear communication, provides regular updates, and demonstrates willingness to address questions or concerns
- **Registry and auditor relationships:** Developer has established relationships with validation/verification bodies (VVBs) and registry personnel

No significant red flags

Patch conducts due diligence on both the project and developer to identify material risks that could compromise project delivery or credit quality. While not all risks are disqualifying, Patch requires transparency about known issues and credible plans for remediation. Red flags that may result in rejection or require mitigation include:

- **Environmental or social concerns:** Documented community opposition, unresolved land tenure disputes, or adverse environmental impacts without adequate safeguards
- **Governance and compliance issues:** History of non-compliance with registry requirements, regulatory violations, or opaque corporate structures
- **Reputational risks:** Developer involvement in projects with significant controversies, greenwashing allegations, or credit quality disputes
- **Legal uncertainties:** Unclear ownership rights, pending litigation, or regulatory frameworks that could prevent credit issuance

Developers must demonstrate awareness of identified risks and present concrete steps toward resolution. Patch reserves the right to decline projects where risks cannot be adequately mitigated.



CRITERIA

Early-stage projects

Demonstration of end-state FIR compliance

Projects that meet Patch's early-stage criteria receive conditional approval, meaning they are accepted into Patch's portfolio subject to meeting standard FIR requirements upon credit issuance.

To achieve conditional approval, developers must provide compelling evidence that the project will satisfy Patch's integrity standards once validated. This evidence can take several forms:

- Third-party ratings or assessments: Pre-issuance ratings from recognized agencies (BeZero, Sylvera, Calyx Global), preliminary assessments from validation bodies that indicate likely FIR compliance, and offtakes from advance market commitments (e.g. Frontier, Symbiosis Coalition) or reputable buyers (e.g. Microsoft).
- Project design documentation: Detailed project description documents (PDDs) or equivalent materials that demonstrate methodology alignment, robust monitoring plans, and credible baseline scenarios
- Preliminary data and monitoring: Early monitoring results, feasibility studies, or pilot data that support project claims and quantification approaches
- Registry feedback: Evidence of positive engagement with registry technical teams or preliminary approval of methodology applications
- Independent technical review: Third-party technical due diligence reports that validate project design and implementation plans

The strength and combination of evidence required varies by project type and risk profile. Projects with less established developers or novel approaches require more robust third-party validation.



04 Glossary

Terms

ALM	Agriculture land management projects may focus on increasing carbon stocks by enhancing soil quality, changing agricultural practices to promote sustainable and regenerative management, or sequestering carbon in woody biomass.
APD	Avoiding planned deforestation projects avoid authorized deforestation, such as the authorized conversion of private land to establish commercial agriculture or cattle pastures.
ARR	Afforestation, reforestation, and revegetation projects are removals projects that build carbon stocks through active reforestation and regeneration of depleted forests.
AUD	Avoiding unplanned deforestation or degradation projects avoid unauthorized deforestation or forest degradation, such as encroachment into protected areas or private land for the establishment of smallholder cropping systems, pastures, or illegal logging.
Article 6	Article 6 of the Paris Agreement established an accounting framework for international transfer of carbon credits and a central UN mechanism to trade credits. Essentially, it amounts to rules for international carbon markets.
BiCRS	Biomass with carbon removal and storage is a project type that involves processing and sequestering biologically-derived carbon, such as crop waste, wood, or other organic residues.
BVCM	Beyond Value Chain Mitigation refers to SBTi's guidance for deploying climate finance above and beyond making emissions reductions within their value chain, including purchasing carbon credits. These guidelines have been released for public consultation, but have not been finalized.
Carbon credit	An economic unit representing one metric tonne of carbon dioxide that has been avoided or removed from the atmosphere.
CDM	The Clean Development Mechanism is a United Nations program that allows a country with an emissions reduction or limitation commitment under the Kyoto Protocol to invest in emissions reductions in a developing country and count those reductions toward their own targets.



Terms

CLF	Conservation of loggable forest projects are improved forest management projects that aim to conserve existing carbon stocks by halting harvesting practices. While focused on current productive lands instead of active deforestation zones, project risks and benefits are comparable to APD projects.
Co-benefit	An additional positive outcome associated with a carbon credit, such as ecological benefits, biodiversity, energy security, improved air quality, and many more.
DAC	Direct Air Capture refers to any technology that chemically removes CO ₂ from the atmosphere.
EF	An emissions factor is a mathematical formula calculating the amount of a pollutant or greenhouse gas that can be associated with an activity like burning wood for cooking.
EOR	Enhanced Oil Recovery is a technology that involves injecting CO ₂ into oil wells to allow for the extraction of fossil fuels.
ERW	Enhanced rock weathering is a method of carbon removal that leverages and improves the ability of minerals to naturally capture and store CO ₂
Ex-ante	Ex-ante credits constitute an emissions reduction that is expected to take place in the future.
Ex-post	Ex-post credits constitute an emissions reduction that has been verified to have already happened.
fNRB	The fraction of non-renewable biomass is the portion of wood fuel used in a carbon project that is unsustainable and contributes to long-term loss of biomass carbon stocks.
Foundational Integrity Review	The process and standards Patch uses to evaluate the integrity of carbon projects.
GHG	Greenhouse gases including CO ₂ , methane, HFCs, and others.
GWP	Global warming potential refers to the amount a given greenhouse gas will contribute to the heating of the atmosphere. Methane, for example, has a GWP approximately 30 times greater than CO ₂ .
HFCs	Hydrofluorocarbons are greenhouse gases that are used in refrigeration and insulation and can be thousands of times more harmful than CO ₂ .



Terms

LCA	A Lifecycle Assessment is a calculation of the total greenhouse gas emissions or environmental impact associated with a product from the beginning to the end of its existence.
LDCs	Least Developed Countries are <u>defined</u> by the United Nations as low-income countries with structural impediments to sustainable development.
MRV	Measurement, reporting, and verification refers to the scientific process of monitoring the climate impact of a carbon credit project, reporting on that impact, and verifying the impact.
The Oxford Principles	A set of <u>four principles</u> developed by climate scientists at University of Oxford to guide the use of carbon offsetting.
PDD	A project design document is detailed documentation for a project's methodology, implementation, expected climate outcomes, calculated emissions reductions or removal, baseline conditions, personnel, data management and reporting, and much more.
Tokenized credit	A digital representation of a credit that can be bought or sold via blockchain on a cryptocurrency platform.
VCM	The Voluntary Carbon Market is an economic ecosystem in which carbon credits are produced, sold, and ultimately retired. Not to be confused with compliance markets, participants in the VCM are not required to engage due to governmental policy or regulation.

Organizations

ANSI	The American National Standards Institute is a nonprofit organization that oversees voluntary standards for various technologies and activities in the U.S.
BeZero	A private company based in the U.K. that provides publicly available risk assessments and ratings for carbon credits.
Change Climate	A nonprofit organization that manages the Climate Neutral Certified Label, a standard for corporate carbon accountability.
European Biochar Certificate	A voluntary industry standard developed by the Ithaka Institute to guide the use of biochar technology in Europe.
Gold Standard	A certification standard for carbon credit projects focused on energy efficiency and renewable energy run by The Gold Standard Foundation, a nonprofit based in Switzerland.



Organizations

ICROA	The International Carbon Reduction and Offset Alliance is a nonprofit organization that manages an accreditation program for certifying best practices in the use of carbon credits.
ICVCM	The Integrity Council for the Voluntary Carbon Market is an independent governance body setting and enforcing a global standard for carbon credits known as the Core Carbon Principles (CCPs).
ISO	A standard development organization headquartered in Switzerland that creates international standards for technology and manufacturing.
OFAC	The Office of Foreign Assets Control of the U.S. Treasury Department that administers and enforces international trade sanctions.
Patch	A software company founded in 2020 to create modern infrastructure and market acceleration to scale the VCM.
Puro.earth	A global standard and registry headquartered in Finland for engineered carbon removal projects and their carbon credits.
SBTi	The Science Based Targets Initiative is a partnership between CDP, United Nations Global Compact, World Resources Institute (WRI), and the World Wide Fund for Nature (WWF) that developed the first net-zero standard, as well as science-based guidelines for meeting it.
Sylvera	A private company based in the U.K. that analyzes and rates the integrity of carbon credit projects.
UNFCCC	The United Nations Framework Convention on Climate Change is a United Nations treaty first adopted in 1992 with the aim of preventing dangerous human interference with the Earth's climate.
VCMI	The Voluntary Carbon Markets Integrity Initiative is a non-profit standards organization. Its Claims Code of Practice provides rules for how companies may engage with the carbon credits in line with net-zero pathways.
Verra	A nonprofit organization headquartered in Washington, D.C. that manages the Verified Carbon Standard (VCS) program, a standard for certifying carbon credits focused on forestry, agriculture, and plastic waste.



Expert contributors to the development of the Foundational Integrity Review criteria:

ALIGNED STANDARDS



United Nations
Climate Change

SCIENTIFIC PARTNERS



RATINGS PARTNERS



A rebalanced planet depends on the climate solutions carbon markets are working to accelerate. Patch's integrity and diligence approach is designed to give carbon credit buyers the confidence they need to help create a livable future.

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Get in touch with our climate team
Whether you have an established climate strategy or are just getting started, let's talk.

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