Sylvera

Framework review committee

CCUS consultation

Feb 6th 4 PM (GMT)

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Our ratings

What Moody's is to bonds credits, Sylvera is to carbon credits.

Our carbon credit rating system gives market participants confidence to transact and deploy capital.

Sylvera

Note: Co-benefits are not included in the overall Sylvera rating/score (AAA-D). Carbon, additionality, and permanence are layered together through matrices to determine the overall Sylvera rating.

Key Concepts

Carbon

Emissions reductions achieved compared to the amount of credits permitted to be issued.

Additionality

Whether emissions reductions/removals above and beyond what would have occurred in the "business as usual" case have materialized as a direct result of revenue from carbon offsets.

Additionality also assesses the likelihood and severity of over-crediting risk that emanates from inflated counterfactual baseline claims.

Permanence

The degree of confidence that carbon will remain sequestered in the project for the long-term (i.e., reversal risk).

Co-benefits

The value the project brings to local communities and the environment beyond the carbon impact.

Contents

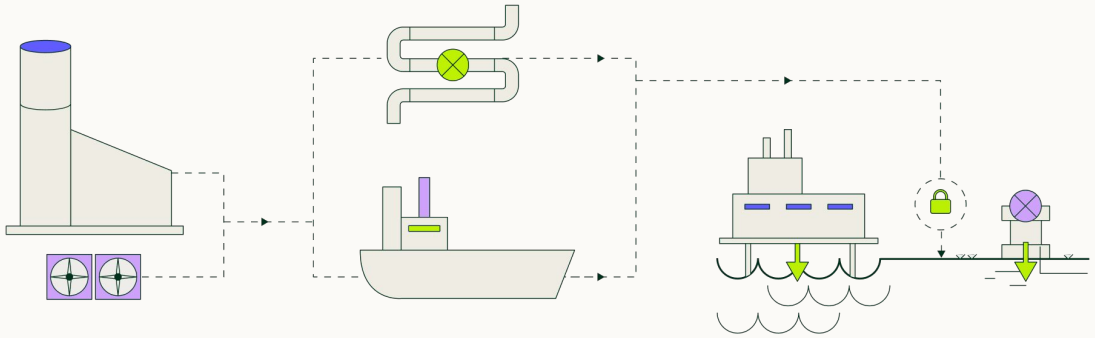
What is Carbon Capture, Utilisation and Storage?

Carbon Capture, Utilisation and Storage (CCUS) refers to projects that consist of capturing CO2 from waste from industrial facilities and fossil fuel generated power plants. The CO2 is then either utilised in other processes and/or stored underground in geological formations.

This framework focuses on **Enhanced Oil Recovery (EOR).**

All CCUS credits issued in the VCM are CCUS-EOR projects.

Direct Air Capture (DAC) and Bioenergy with Carbon Capture and Storage (BECCS) are other CCUS categories that will be covered in their own frameworks.



Capture
Capturing CO2 from fossil or biomass-fueled power stations, industrial facilities, or directly from the air.

Transport
Moving compressed CO2, by ship or pipeline from the point of capture to the point of use or storage.

Storage
Permanently storing CO2 in underground geological formations, onshore or offshore.

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Carbon Score

Definition

Sylvera Carbon Score verifies whether a project is accurately reporting on the emissions reductions achieved by the activity during the credit history.

If no independent data is available to score a project, the carbon score will be neutral and the project **rating will be provisional**.

Components

Credit History (Carbon Score)
The project reported carbon reductions calculated by the project using their own estimated baseline and project emissions on an vintage basis.

Example

A project could achieve a high carbon score of 100% if CO2 injected by the project and reported in the project documents is in line with data reported independently by third party.

A Credit History below or above 100% means that there is a mismatch between the CO2 injected by the project and the data reported by the project in project documentation.

Total Annual GHG Reductions (tCO2e)	**=**	**Project Baseline Emissions in each year (tCO2e) - Project Emissions in each year (tCO2e)**

Overview

Our carbon score is based solely on Credit History and it verifies the **extent to which the project has actually achieved its reported carbon capture.**
It quantifies the delivered emissions reductions for each permitted credit by vintage but does not assess the appropriateness of the baseline (reported baseline figures are used in carbon score; over-crediting risk in additionality addresses the baseline).

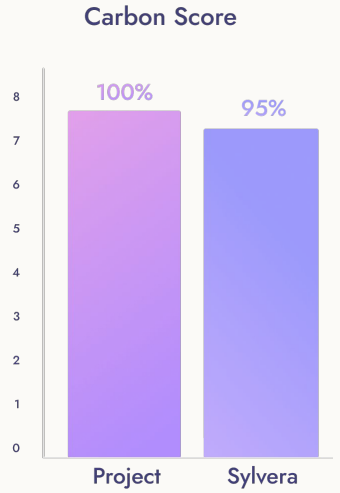
The **carbon score must be considered alongside the additionality score**, which considers whether the selected baseline is appropriate, to have a full and complete understanding of project performance, as:

- The carbon score assesses whether the emissions observed in the project match those that have been reported by the project.
- The strength of baseline analysis determines the extent of any overissuance as a result of an inflated baseline (over-crediting risk).

Credit history

$$\text{Carbon Score} = \frac{\text{Sylvera Audited ERs}}{\text{Verified ERs}} = \frac{\text{Audited Project Baseline Emissions} - \text{Audited Project Emissions} - \text{Audited Project Losses}}{\text{Project Baseline Emissions} - \text{Project Emissions}}$$

- **Sylvera Audited ERs** = Third party/independent net CO2 emission captured by the CCUS-EOR project
- **Verified ERs** = Net emissions reductions reported by the project and verified by the registry, equivalent to credits that can be issued (i.e., permitted issuance)
- **Project Baseline Emissions** = Net CO2 purchased by project during its operation (i.e. quantity of CO2 used by project for injection)
- **Project Emissions** = Carbon emissions by the project itself during its operation (i.e., electricity utilisation, etc.)
- **Project Losses** = Potential losses from the project activity



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Additionality

Definition

Sylvera's additionality score assesses both:

i) whether emissions reductions above and beyond what would have occurred in the "business as usual" case have materialized as a direct result of revenue from carbon offsets.

ii) the likelihood and severity of over-crediting risk that emanates from counterfactual baseline claims.

Components

Additionality of activities:
Financial additionality, policy and regulatory additionality, and common practice.

Over-crediting risk:
Strength of baseline tests audit the baseline CO2 emissions factor and its constituents against third party data. It also takes into account the full cradle to grave life cycle assessment of the project.

Integration:
Scores are integrated in an asymmetric matrix that allows for thresholding logic to be employed.

Example

An additional project is one that has been sanctioned as a direct result of the offset revenue and has low over-crediting risk.

A project will score highly on additionality of activities if it can demonstrate that the carbon finance was required for the project to be sanctioned.

A project will score highly on over crediting risk if it can demonstrate that it's baseline emissions were established accurately.

Scoring

Additionality is assessed by a blended view of (i) whether the projects' activities would only have taken place as a result of the offset project revenue and (ii) by taking into account the Life Cycle Assessment of the project's emissions and losses.

Additionality is conceptualised as a scale that distinguishes the relative degree of additionality between projects.

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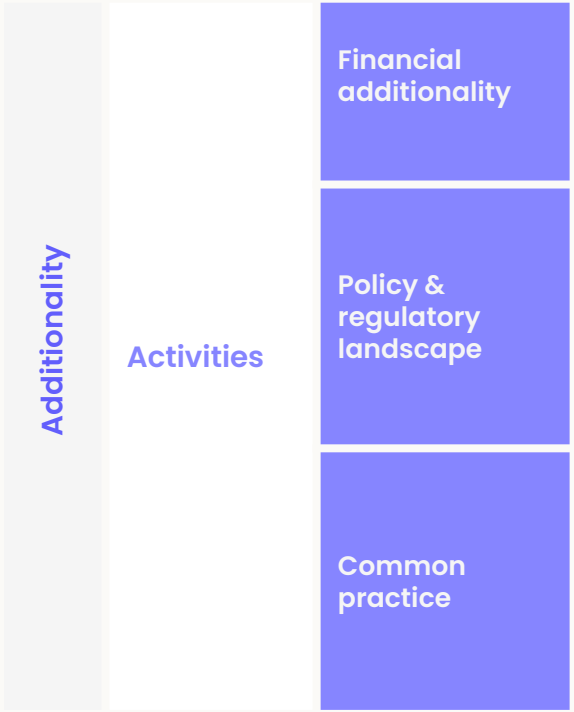
Activity – Rationale



Why we ask?	How we ask?
If a CCUS-EOR project is an attractive investment without offset revenues then the carbon credits issued by the project are likely not additional.	We check the project economics to see if the project activities would be sub-economic in BAU scenario and that the offset revenue bridges the economic viability gap of the project.
If there are regulations or incentives in place that enforce or encourage the capture of CO2 in the project-scenario, or would have hindered the activities described in the BAU scenario, then the carbon credits issued by the project are likely not additional.	We check if the country or province provides any incentives to CCUS-EOR projects, and then incorporate the amount of the incentive or subsidy into our financial model accordingly to see if it impacts the project's financial additionality.
The more similar CCUS-EOR projects there are within the region and the lower the percentage of these projects that have offsets associated with them, the less additional the carbon credits are likely to be.	We assess how widespread similar CCUS-EOR projects are in the country and state where the project is located. We also calculate how many of these projects have offsets associated with them.

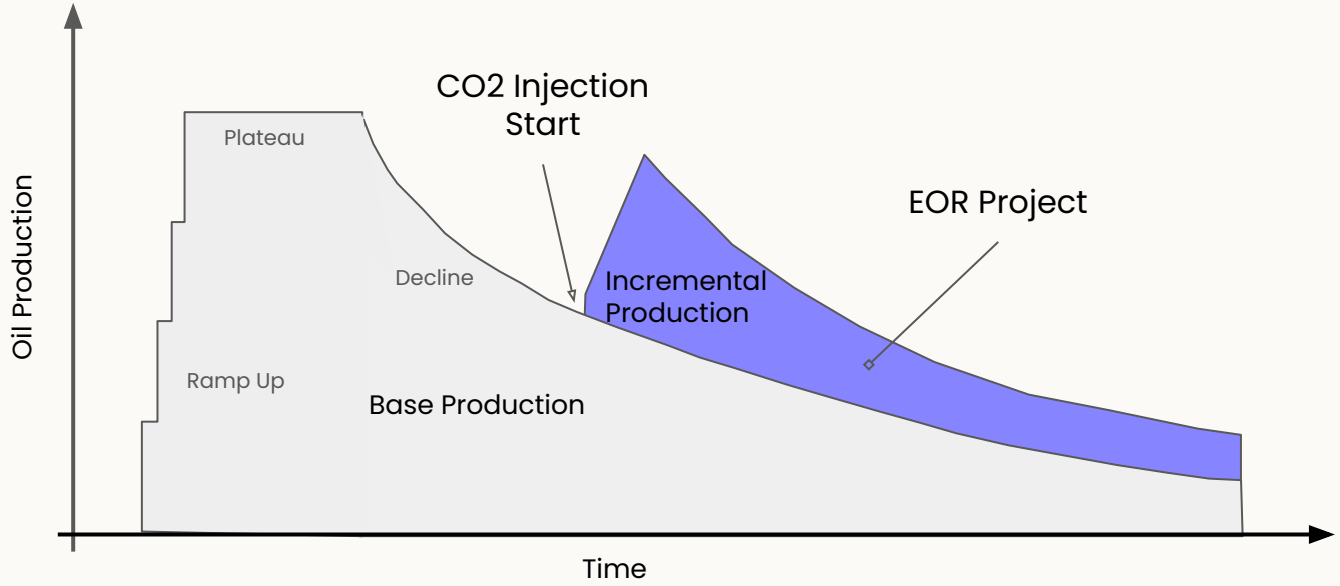
Additionality

Activity - Sub-Components

Component	Sub-component	Description	Rationale
Financial additionality	Financial inputs	Are the projects' reported economics consistent with the economics from Sylvera's proprietary economic model?	When financial information is disclosed by the project, we will compare its revenue, costs, and economic KPIs to Sylvera's proprietary economic model. We will ensure revenue and costs are in line with country level historical figures to ensure that revenue wasn't understated and costs weren't overstated in the reported figures so as to make the BAU economics appear subeconomic.
	BAU scenario analysis	Is the project sub-economic under its business-as-usual scenario?	If the Sylvera calculated BAU IRR is less than the benchmark hurdle rate then the project is likely to be subeconomic in the BAU scenario. This test is based on the the financial assumptions from the project documentation or from the high level costs model.
	Project scenario analysis	Are the carbon offsets revenues making the project economic under its project scenario?	If the Sylvera calculated BAU IRR is less than the hurdle rate, and if the project scenario IRR is higher than the hurdle rate, then it is likely that the project requires offset revenue to bridge the economic viability gap. This test is based on the the financial assumptions from the project documentation or from the high level costs model.
Policies and regulations	Financial incentives	Are there additional incentives offered to encourage this project type?	If additional incentives are given that benefit the running of the project then the carbon credits are likely less additional (eg. 45Q tax credit in the U.S.). Incentives will be included as additional revenues in the financial model to be reflected under the additionality score.
	Local law requirements on CO2 venting	Are there laws requiring that CO2 cannot be vented to the atmosphere and must be captured?	If the project is simply following state or country law, then the carbon credits are likely less additional.
Common practice	Common practice analysis	How many similar projects are there in the region/country? How many have offsets associated with them?	The greater the number of similar (non VCM) CCUS-EOR projects there are in the country/state at project start year (t=0), the less additional the project is as it is common practice and part of a BAU scenario without carbon finance.

Activity – Financial Additionality Example

The Business-as-usual (BAU) assessment of CCUS-EOR, will take into account revenues from the incremental oil and gas produced by the injection of the CO2 into the wells from start of the CCUS-EOR project operation.



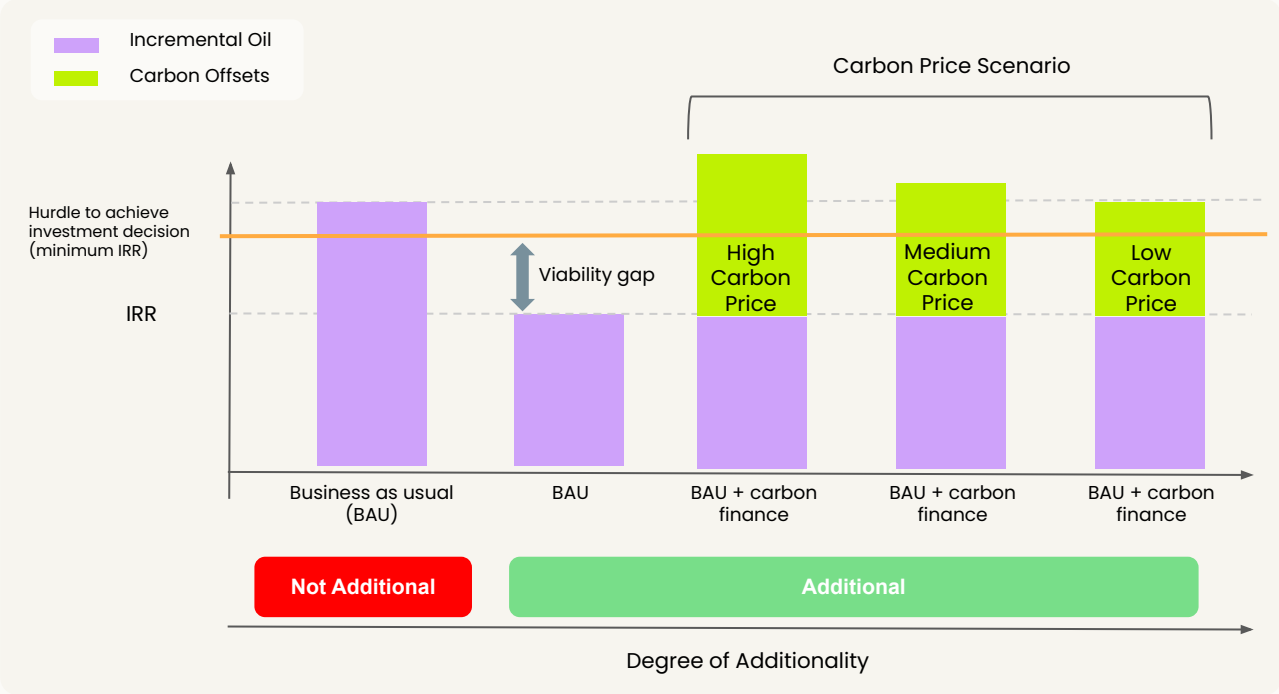
Activity – Financial Additionality Example

A project is **financially additional if** the **offset revenue bridges** the economic **viability gap** so that **emission reductions are realised**, which would not have otherwise taken place in business-as-usual (BAU).

The investment hurdle, or minimum rate of return, represents the **return sufficient for a value minded investor** to proceed with the investment.

This is what our 1-5 rating describes; How likely it is that the sale of credits lead to the investment decision.

The Sylvera proprietary economic model assesses the business as usual economics (**without** offset revenue) as well as the project economics (**with** offset revenue) to assess the viability gap and **ensure that carbon finance was required** for the project to reach investment decision.



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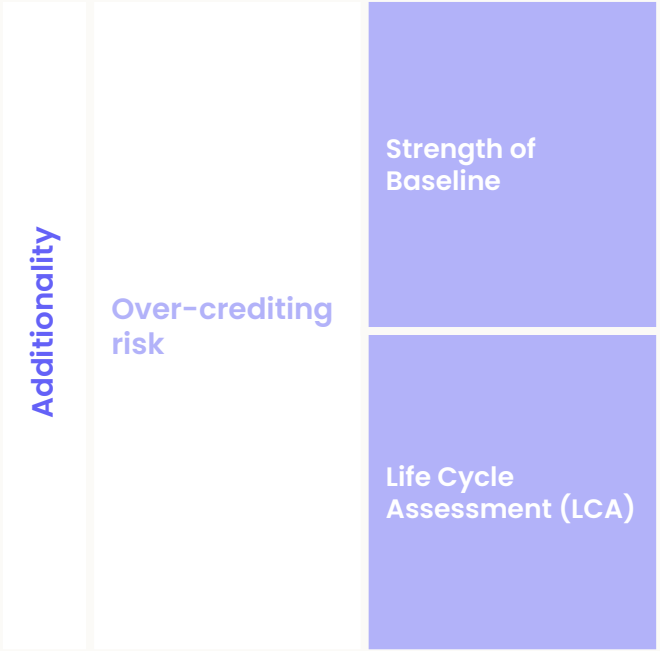
Over-crediting - Rationale



Why we ask?

The baseline is verified using external data and repeating the calculation given in the project documentation. The baseline is used to calculate the carbon credits therefore if the strength of baseline is low, there is a high risk the carbon credits are not additional.

LCA is used to evaluate the environmental impact of projects. It assesses the entire life cycle of a project, from the extraction of raw materials to the use of the end-products to determine the total CO2 emissions. By conducting an LCA of the projects, we can identify areas where emissions have occurred and have not taking into account in the project's baseline.

How we ask?

We assess the whether the CO2 would've been vented without the project and then we compare the CO2 sales volume given by third parties to the reported CO2 injection volume to calculate the baseline value.

In the life cycle assessment we check the system boundary of the assessment, the presence of major life cycle emission sources and the parameters used. If the system boundary is cradle to gate instead of cradle to grave then significant lifecycle emissions have been overlooked.

Additionality

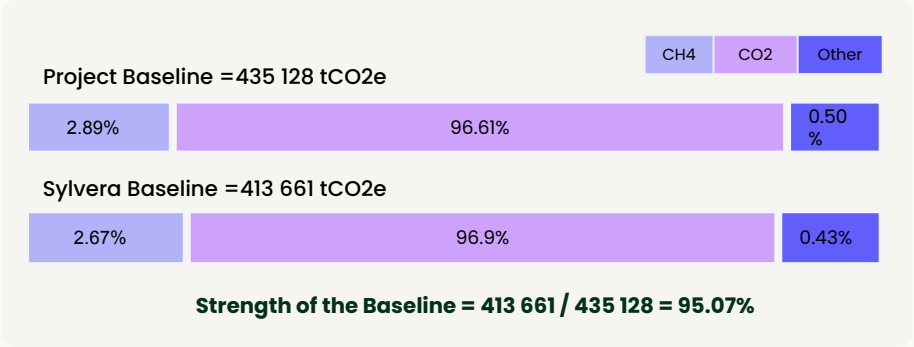
Over-crediting - Sub-Components

Component	Sub-component	Description	Rationale
Strength of baseline	Raw Gas Sales	If the raw gas wasn't sold to the project, would it otherwise be vented to the atmosphere and what volume of gas would be vented in this case?	A lower CO2 volume sold to the project compared to the reported injection volume signals a higher risk the reported gas injection volume is not additional but merely recycled.
	CO2 Concentration	Has the correct concentrations of gas mixture and conversion factors been used to calculate the baseline emissions?	The conversion of CH4 to CO2 emissions is highly important in calculating the baseline. Dependant on the concentration of the CO2/CH4 gas mix, the baseline emissions can have an effect on the over-crediting risk.
Life Cycle Assessment (LCA)	Project Emissions	What emissions are included in the project emissions and have these all been accounted for?	To investigate the effect of emissions that were not accounted for by the project or would have an effect on the emissions of the project.
	Project Losses	Does the project lose gas through escaping throughout the project duration and is this accounted for by the project?	Additional losses not accounted for would increase project emissions and reduce the additionality of the carbon credits.

Over-crediting - Strength of Baseline Example

$$\text{Strength of Baseline} = \frac{(\text{Raw gas sales} * \text{CO2 concentration}) + (\text{Raw gas sales} * \text{CH4 concentration} * \text{CH4 to CO2 conversion factor})}{\text{Verified Project Baseline}}$$

- **Raw gas sales** = Gross gas sales extracted from gas field
- **CO2 and CH4 concentration** = Third party/independent concentration of CO2 and CH4 of the raw gas
- **CH4 to CO2 conversion factor** = Third party/independent conversion factor from CH4 to CO2 of raw gas
- **Verified Project Baseline** = Gross CO2 amount injected for storage (without project emissions), reported by the project and verified by the registry



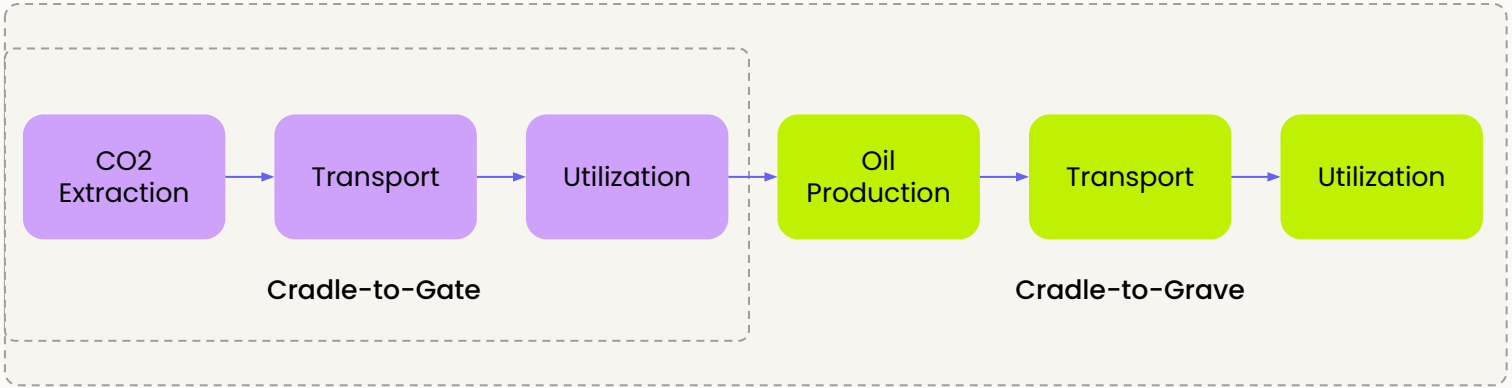
When calculating the Strength of Baseline, we will be comparing the gas concentration values from the project with our own values from independent sources and validating the CO2 conversion factors. The gas sales volume will come from the project reported data unless independent data is available.

Over-crediting - Life Cycle Assessment Example

How we assess the Life Cycle Project Emissions

The project should demonstrate that an appropriate life cycle assessment was conducted to account for any emissions associated with the sourcing, transport, production and utilization of the CO2. This **should be conducted for cradle to grave rather than cradle to gate**. Cradle to grave covers the whole lifecycle of the product including any co-products and the final decommissioning of the project.

The principle of additionality means the project would not have taken place without VCM finance. Therefore, emissions from the end use of all products produced by the project must also be taken into account. For CCUS with EOR, this means any **emissions from incremental oil production must be accounted**.



Over-crediting - Life Cycle Assessment Example

How we assess the Life Cycle Project Emissions - CCUS-EOR

Project Emissions & Losses	=	End-use product emissions + Electricity emissions + Other emissions + Project losses

- **End-use product emissions** = Project emissions occurring as a result of the use of the product rather than during its production or disposal (i.e. emissions from the incremental oil production)
- **Electricity emissions** = Project emissions occurring as a result of production process using electricity. If the project is on-grid, we will consider the emission factor reflecting the current energy mixt
- **Other emissions** = Project emissions due to transport or waste management
- **Project losses** = Amount of CO2 lost during the operation, transport and injection. This variable will be assess as a percentage of the total amount of project emissions

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Permanence

Definition

Sylvera's Permanence score assesses the risk that avoided emissions or removals will later be reversed and CO2 released back into the atmosphere.

During EOR, inject CO2 not extracted alongside oil will become trapped due to a confining layer above the oil reservoir.

CCUS-EOR projects must demonstrate that this volume of CO2 is permanently sequestered in the reservoir.

Components

Geologic Risk

Geologic risk assesses the impact of particular geologic attributes on the likelihood that CO2 will return to the atmosphere during or post-injection.

Anthropogenic Risk

Anthropogenic risk considers the rigor of pre- and post-injection monitoring plans, both of which may impact the likelihood of CO2 returning to the atmosphere during or post-injection.

Example

A project can receive a high permanence score if adequate measures were taken to ensure low geologic and anthropogenic risks during and post-CO2 injection.

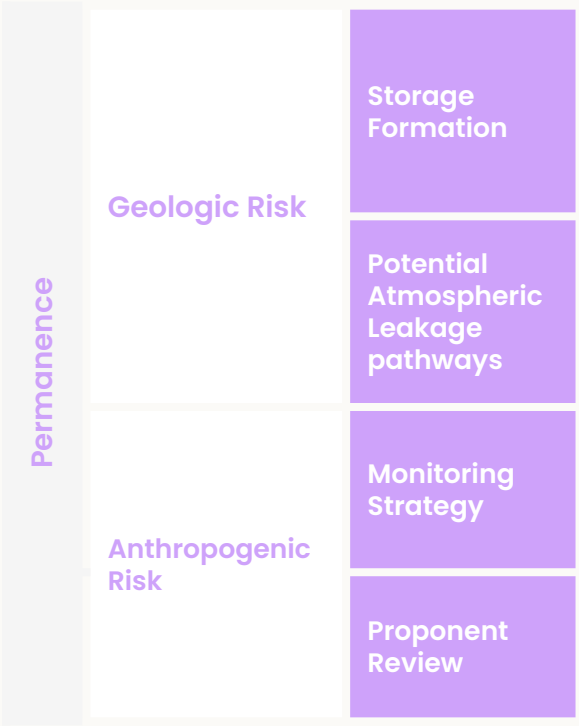
Scoring

Permanence is assessed by considering a traditional risk matrix approach for the two major risks to carbon stock.

The final score is calculated considering the additive and maximum risks present in the project. The input of geological variables, record of past events, project specific conditions and mitigative activities are used to inform the risk scoring.

Permanence is conceptualised as a scale that distinguishes the relative degree of non-permanence (or reversal) risk between projects.

Associated Risks - Overview



Why we ask?	How we ask?
Properties of the storage formation can impact the likelihood of CO_2 remaining sequestered.	We create a migration risk matrix based on the information given by the proponent cross-referenced with newer research on storage in hydrocarbon reservoirs.
Migrated CO_2 can leak to the atmosphere through other CO_2 injection wells, oil or gas production wells, monitoring wells, abandoned wells, or faults and fractures.	We use location analyses based on available well and geologic data for the oil fields to assess potential leakage risk, including post-project activities.
Monitoring key indicators of CO_2 migration is a critical component of effective risk management.	We perform a comparative analysis of proponents' monitoring plan with the federal and state-level guidelines, as well as more recent legislative standards for storage in hydrocarbon reservoirs.
Proponent expertise is crucial to the development of a robust project design and monitoring plan. Documented leakage is also a serious cause for concern.	In addition to independently reviewing proponents' prior experience in EOR, we research leakage incidents and other monitoring violations both during and after the project period.

Contents

Co-benefits

Definition

The extent to which the project is implementing activities to support local biodiversity and communities, as well as, the scale and likely impact of these activities.

Components

Community:
Assess the SDG activities, as well as the the scale and additive benefit of these activities.

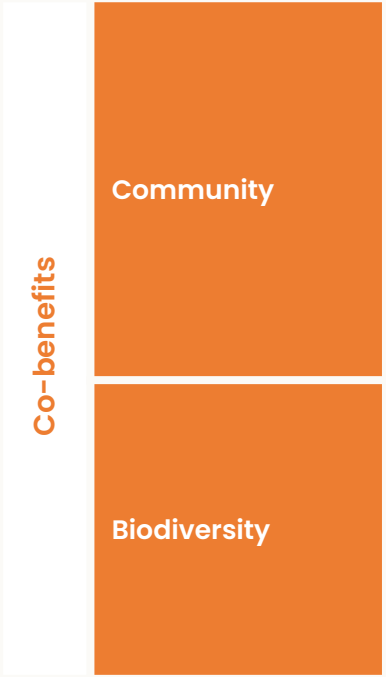
Biodiversity:
Local flora and fauna species diversity, threat levels, protection activities of the project.

Example

A project could achieve a high community co-benefits score if it employs local communities for construction and operation of the facility and ensures the community interests are aligned with the project's goals.

A project would achieve a low biodiversity score if it leads to biodiversity loss (e.g., building a facility on a protected area).

Co-benefits: Activity Benefits - Rational



Why we ask?

CCUS-EOR projects may impact local communities through changes to the local economy, land use, and access to resources.

All impacts need to be understood to ensure that the community is aware of and involved in the project.

How we ask?

We assess the extent to which a project promotes inclusive and sustainable economic growth, full and productive employment, and decent work for all, in addition to community impacts aligned with other SDGs.

By default, CCUS-EOR projects will score poorly given the nature of their operations. Ratings will be increased only if we are able to find any improvements or action taken by the project.

CCUS-EOR projects may have limited impacts on species and ecosystems compared to forestry and land-use projects.

We need to identify if measures have been taken to improve local biodiversity.

We measure any positive impacts CCUS-EOR project activities may have on biodiversity.

As with most infrastructure developments, CCUS-EOR projects do not protect or enhance habitats or natural ecosystems, leading us to assume that projects have no biodiversity unless proven otherwise.

Our mission is to be a source of truth for carbon markets.

Learn more at sylvera.com

Sylvera