Our Carbon Credit Ratings Framework For Improved Cookstove Projects

Incentivizing investment in real climate action



Introduction

Sylvera carbon credit ratings are the most reliable and trustworthy in the market.

Sylvera has developed a rigorous bottom-up approach in order to produce the most accurate ratings and analyses for carbon projects in the VCMs.

What sets Sylvera apart

• **Project-type-specific frameworks:** We build rigorous frameworks and production systems for every project category to accurately test project design, carbon accounting, and climate impact claims.

Sylvera's frameworks are peer-reviewed by a committee of experts and carbon market stakeholders – including project developers & registries – to ensure scientific consensus. We publish our frameworks so buyers understand exactly what we test and how we do it. <u>Read our white paper for more information.</u>

• Unparalleled depth & accuracy: We extract, clean, and organize data from project design documentation (PDD) and every monitoring report. Then we meticulously build carbon, strength of baseline and financial additionality models from the ground up to validate emissions reductions or removals claims and evaluate project economics.

Our project assessments are the most comprehensive in the market, providing granular analysis of core project characteristics, insightful data visualizations, and interactive maps.

 Independent Data Validation: Our expert analysts leverage advanced machine learning (ML) technology, verified, independent data, and proprietary field data to test the accuracy of credit issuances and claims.

The comparison of independent data specific to each project against the data reported in the project's documentation is the cornerstone of high quality due diligence. For example, we use market-leading geospatial ML models when rating nature-based solutions.



The challenge

While Improved Cookstove projects have the potential to provide a positive impact on the environment, they also face several common shortcomings that may result in an overestimation of the effectiveness of the project and therefore over-issuance of carbon credits.

Some cookstove projects fail to consider the cooking practices, cultural preferences and needs of the users. As a result, the stoves may not be used as intended; for example, 'stove stacking' can occur when the improved cookstove is used in addition to the traditional cooking method, or in some cases, the new cookstove is abandoned altogether.

In addition, some cookstove projects use low-quality materials and lack proper maintenance, repair or replacement of the stoves, resulting in a shorter lifespan and reduced efficiency over time. These projects also suffer from challenges in monitoring and evaluation. Project developers may not have adequate monitoring and evaluation processes in place to measure the impact of the stoves on reduced deforestation, usage rates, health and other factors.

The solution

To accurately assess the quality and risks of these projects, we have developed a comprehensive framework that addresses key aspects of cookstove projects, differentiating between high and low risk projects. We are using a variety of sources to generate our ratings:

- 1. We utilize industry datasets to account for policy and regulatory barriers and common practice.
- 2. We analyze technical information about the cookstove model, WHO cooking fuel data and GIS data to estimate the risk of over-crediting.
- 3. We run a climatic risk model to assess the level of permanence of the biomass carbon stock that is being saved as a result of the project activity.

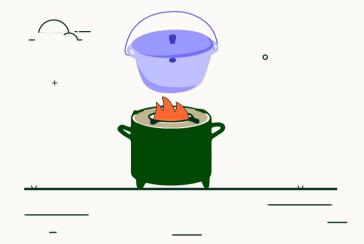
This ensemble of methods allows us to rate the project's performance from many different angles.



Key accounting variables and concepts

Improved Cookstoves	Improved Cookstoves (ICS) are solid-fuel stoves that reduce CO2 through more efficient fuel usage compared to traditional biomass technologies and open fire.
Clean Cookstoves	Clean cookstoves completely eliminate the use of biomass fuels such as firewood and charcoal. This type of stoves is not covered by Sylvera's ICS framework.
fNRB	Fraction of Non Renewable Biomass (fNRB) refers to forest renewability; specifically, to the percentage of biomass (e.g. wood) that cannot be naturally replenished or renewed within a short period of time.
Baseline EF	The baseline Emission Factor (EF) is a coefficient that relates the amount of fuel burned to the amount of CO2 emissions generated. The IPCC biomass EF value of 112 tCO2e/TJ (tonnes of CO2 equivalent per terajoule) is widely used as default when calculating the baseline EF. However, the actual baseline EF can vary depending on the prevalence of other available fuels in rural and urban areas in target countries, and their associated EF values.
Stove Stacking	Stove stacking is a practice where multiple stoves are used simultaneously to meet a household's cooking needs. When traditional stoves are used in combination with improved cookstoves, the overall emissions can be higher than if only one cooking method was used.
Performance test	Performance tests evaluate the technical efficiency of cookstoves and can be conducted in a laboratory setting under controlled conditions [e.g. The Water Boiling Test (WBT)], or on-site [e.g. the Kitchen Performance Test (KPT)] that evaluates stove efficiency, emissions, and fuel consumption in the context of local cooking practices and fuels.
Usage test	The usage test monitors user behavior and stove adoption in real-world settings. It evaluates user uptake, stove maintenance, and stove stacking, and provides valuable information on how the stove is adopted and used by the community.
Over-crediting risk	This refers to the risk that the project has issued credits in excess of what is justifiable against the business as usual scenario.
Project emissions	Emissions associated with ongoing operations of the carbon credit project.
Vintage	This refers to the year, or timeframe, associated with an issued carbon credit.
Carbon credit	A tradable unit representing one metric ton of carbon dioxide (CO2), or an equivalent amount of another greenhouse gas (GHG), avoided or removed from Earth's atmosphere.

Improved cookstoves are designed to be more efficient and cleaner burning than traditional cookstoves, which are commonly used in many parts of the world, especially in developing countries. Traditional cookstoves typically burn solid fuels such as wood, coal or agricultural waste, which can produce large amounts of smoke and other harmful pollutants. In addition to their negative health effects, these stoves also contribute to deforestation and climate change.



Improved cookstoves are a popular project type in the voluntary carbon markets. They are classified as technology-based avoidance/reduction solutions.

From a user's perspective: improved cookstoves offer a range of community benefits such as reduced fuel costs, better energy access, time saved in cooking and collecting wood, and empowering women who are often responsible for collecting fuel for cooking in traditional stoves. Employment opportunities can also come via the production and distribution of the improved cookstoves.

From a buyer's perspective: these projects deliver additional benefits beyond carbon avoidance, such as health benefits, reduced deforestation and social and economic benefits for households. These co-benefits make improved cookstove projects an attractive option to investors and buyers.

From a developer's perspective: improved cookstoves present an attractive opportunity for project developers. There is demand for ICS projects especially in remote or rural areas, where access to energy is limited and traditional cooking methods are still prevalent.

Overall, improved cookstoves projects offer a compelling combination of simplicity, co-benefits and additionality of activities, which makes them a popular option in the voluntary carbon market.



What we look for in high quality Improved Cookstoves projects

Our rating scale



When key data required to fully evaluate a project is missing or is incorrect, Sylvera does not issue a complete Sylvera rating. **Improved Cookstove projects currently lack some information to provide a full rating.**

Instead, Sylvera has developed a provisional ratings framework to provide an assessment of the carbon credits based on the best information available to date. When new data is issued and if it satisfies all our criteria for rigorous analysis, Sylvera will reassess the project and issue a complete Sylvera rating.

The provisional Sylvera rating is still based on a combination of three core scoring pillars: carbon, additionality and permanence.

To arrive at our provisional rating, we first integrate Carbon score and Additionality in an intermediate Impact score, which then is integrated with Permanence resulting in our top level rating. Provisional ratings will have different scoring matrices to fully-rated projects.

Sylvera rating scale

Sylvera issues a Complete Rating when we have access to all the key data (ranging from earth observation data to monitoring reports provided by project developers and restries) required to rigorously assess a project according to our proprietary, bottom-up framework.

Each project we rate receives a discrete letter rating (AAA-D) with sub-scores for carbon, additionality, permanence and co-benefits, in addition to an in-depth report.



Our top level Sylvera Ratings span from AAA-D and reflect whether each credit associated with the project is likely to remove 1 metric ton of CO2e emissions.

This rating is derived from a combination of scores that assess the **carbon** performance, **additionality** and **permanence** of the project. The scores in these three core pillars are combined in a series of matrices to ensure that underperformance in one key area does not get overshadowed by high performance in others.

Co-benefits are also assessed but they do not feed into the Sylvera Rating, as they do not have a direct bearing on the climate impact of carbon credits. Including them in the Sylvera Rating could lead to a high co-benefits score obscuring poor performance on carbon removal. Aspects of the project relating to co-benefits that could materially impact the project's ability to deliver it's stated climate benefit are, however, reflected in the Sylvera Rating.



Carbon score

Sylvera's carbon score verifies whether the project has delivered on its carbon claims by comparing permanence adjustment factors to Sylvera's calculated factor using third-party data.

Additionality score

Sylvera's additionality score assesses the likelihood the project activities would have been implemented in absence of the carbon revenues. It also quantifies the likelihood and extent the project is over-issuing credits due to an underestimation of life cycle emissions or the overestimating the stability of the Improved Cookstoves stemming from its chemical composition.

Permanence score

Sylvera's permanence score assesses whether the carbon removed by the project is likely to stay sequestered based on natural risks (fire, drought etc.) and anthropogenic risks.

Co-benefits score

Sylvera's co-benefits score assesses the scope and relative impact of project activities on local biodiversity and communities - which are linked to UN Sustainable Development Goals (SDGs).

Given the **inherent uncertainty in carbon accounting**, it is not possible to produce full ratings for Improved Cookstoves credits.While the carbon score is assigned a neutral score, the other pillars are assessed in a similar manner to other project types, on a scale from 1 to 5.



What does the voluntary carbon market need from ICS projects?

1. Data transparency and traceability

To enable trust and increase confidence in ICS projects, developers need to be transparent and share data. It will ensure that the emission reductions (ER) are accurate, measurable and additional. This includes specific locations of the project's activities, financial data including receipts and certificates to demonstrate the need for carbon finance, and any calculation proving the amount of emission reductions.

2. Conservative assumptions for fNRB and EF

ICS Projects should translate fuel use into GHG emissions (EF), and only be credited for the proportion of emissions reduced from non-renewable sources (fNRB). In order to do so, it is imperative that projects avoid using default values wherever possible, take into account local and project-specific factors, and provide elaborate explanations for the thought process behind the values.

The most cost-effective way to generate an fNRB value is by using sub-national level values generated by Bailis et al. (2015). As for EF, using the 2006 IPCC default value will most likely result in overestimation whereas assuming EF based on future fossil fuel use is a potential source of underestimation. A suggested alternative is to use a weighted average considering the proportion of cooking fuels used in urban and/or rural areas (reported by the WHO) and the respective IPCC EF values of each fuel type.

3. Continuous and representative monitoring

ICS projects must ensure that the households actually use the improved cookstoves and stop or reduce stove stacking. Methods for monitoring the level of uptake include kitchen performance tests (KPTs) for a sample of households, questionnaire surveys, and laboratory tests (e.g. WBT).

To ensure a high quality ER assessment, ICS projects should use robust sampling methods (e.g. KPT) and avoid simplistic surveys (e.g. questionnaires) or unrepresentative tests (WBT). Sampling should be frequent (more than once a year and spread out to capture seasonality), and for a decent sample size in proportion to the size of the project.



Carbon score

What is it?

Sylvera's carbon score verifies whether a project is accurately reporting on the carbon removals achieved by the activity. If multiple vintages have been permitted, the carbon score is a vintage-weighted average score.

Note: The carbon score must be considered alongside the additionality score, which considers the overcrediting risk, to understand the climate impact of the project.

Measuring carbon reductions for ICS projects

ICS projects claim credits through assumed reductions in wood fuel usage and associated reduced woody biomass extraction. All ICS projects have been assigned a "neutral" carbon score due to limitations in measuring the levels of forest degradation and drawing a causal connection between forest degradation and cookstove activities across large distribution networks.



Additionality score

What is it?

Sylvera's additionality score assesses whether (1) the projects' activities would only have taken place as a result of the carbon project revenue and (2) the project has sold too many credits due to overestimation of the emission reduction.

Why does it matter?

Additionality underpins the validity of credits issued by a project. If distributing ICS would have occurred without revenue from the sale of carbon credits then the activity is not additional. If the project is not additional, then one credit purchased does not equate to 1 metric ton of carbon avoided and, therefore, yields no climate benefit above the business as usual (BAU) scenario. A measure of the likely additionality of carbon credits is essential to understand their climate impact.

The underlying premise is that ICS activities are likely additional. However, a lack of financial reporting in project documentation prevents an assessment of financial additionality. As such, projects' additionality of activities is assessed by its Policy and Regulatory and Common Practice analysis.

Additionality of activities	Policy & regulatory barriers: If subsidies or capital is provided by the government to support Improved Cookstoves projects, then the project may have diminished additionality if these subsidies caused the business as usual scenario to be economic. If the subsidies are only complementary to carbon finance, the project is likely additional.
	Common practice analysis: The greater the level of market penetration in the region, the less additional the project is as it is common practice and part of a BAU scenario.
Over-crediting risk	fNRB and EF assessment: These parameters can be understated or overstated. We compare the values provided by the project to peer-reviewed third party data.
	Monitoring methodology: There is a risk of potentially inflating the results by using simplistic and unrepresentative testing methods. The size and frequency of the sample also impact the accuracy of the reporting.
	Cookstove uptake and stove stacking: We look for indicators of actual usage of the ICS and the discontinued usage of old cookstoves. If the uptake rate is low then the project is less additional as it means that the improved cookstoves are not being used instead of traditional cookstoves.



Spotlight on over-crediting risk

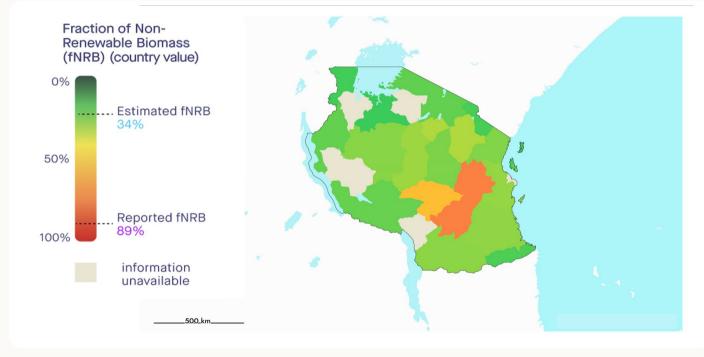
How does Sylvera assess the over-crediting risk?

As a direct result of the challenge of measuring carbon reductions, the main risk of ICS projects is over-crediting.

Sylvera is assessing this risk by accounting for the parameters, methodologies and steps taken by project developers to mitigate the over-crediting risk.

ICS projects need to only account for the proportion of emissions reduced from non-renewable sources, implement rigorous baseline assessments to translate fuel use into GHG emissions, and quantify the proportion of households that use them as intended.

They can also take active steps to maximise the appropriate usage by increasing awareness and providing training on the proper use of the stoves and follow up with households to ensure that the stoves are being used as intended.



Source: Bailis et al (2015)

How we assess the fNRB value

Sylvera compares the fNBR value assigned by the project with third-party peer-reviewed estimated values. This is an incredibly important component in the calculation of emissions reductions. While many projects use default fNRB values of 80-90%, indicating that the forest would almost entirely not regenerate, it has been demonstrated in some cases that the real fNRB is closer to 30-40% (see example).



How we assess the EF value

Sylvera analyzes the project's claims about baseline EF and compares them to a country-specific weighted average EF, based on data from the World Health Organization about what types and proportions of cooking fuels are used in urban and rural regions. If a project claims that in the baseline scenario, 100% of the fuel would be woodfuel, but it operates in an urban area where the majority of the population is using liquefied petroleum gas (LPG), then there is a risk of inflated emission reductions.

How we assess the monitoring methodology

We also account for the type, frequency and size of tests used to determine the level of cookstove efficiency and usage. There is a risk of potentially inflating the results by using inadequate testing methods. For example, when calculating the level of the ICS efficiency, the lab-based WBT is unlikely to reflect real-world conditions. The size and frequency of testing also impact the accuracy of the reporting.

How we assess the uptake level

Sylvera examines indicators of actual ICS usage and abandonment of the baseline technology. We check whether the project accounts for stove stacking and applies a discount rate when calculating emission reductions. It is a red flag when projects report 100% usage rate / zero stove stacking, as it's unlikely.

We also look for evidence of any actions taken to minimise and disincentivize stacking. A positive indicator is when projects ask users to turn in their old stoves, provide a proof that they have been discarded, or provide training tools to explain the benefits of improved cookstoves and the harms of traditional cookstoves.

In addition to assessing these indicators reported by the project, Sylvera is also conducting a literature review considering peer-reviewed reports, papers and studies to account for external evidence of the level of stove stacking in the project location.

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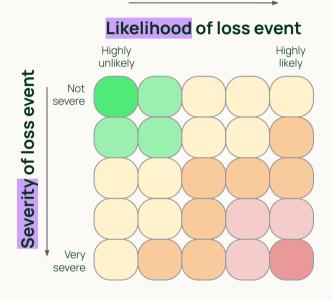
Permanence score

What is it?

Permanence refers to the risk that the sequestered carbon will later be reversed and released back into the atmosphere. ICS activities aim to reduce the demand for non-renewable biomass, so they indirectly reduce forest degradation. Reported emission reductions are therefore based on enhancing forest carbon reservoirs, which are susceptible to non-permanence risks. Sylvera assesses the level of risk on a sub-national level to generate an average risk score.

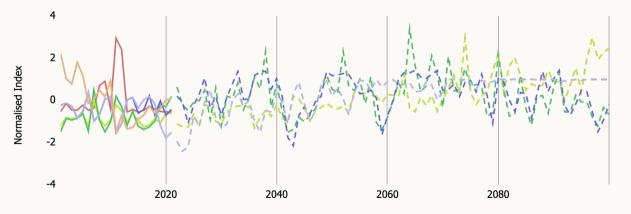
Improved Cookstoves credits have a low permanence risk given the large geographical scale of the activities. For each of the six potential causes of carbon stock loss (Fire, Drought, Storms, Pests & Pathogens, Floods, Anthropogenic) we use a risk matrix to evaluate the risk individually by considering factors that influence the likelihood and severity of events.

We also consider the interactivity of any risks present (e.g. drought events can exacerbate the likelihood of a pest outbreak). The final score is calculated considering the additive and maximum risks present in the administrative boundary. The input of climatic variables, record of past events, sub-national conditions and project activities are used to inform the risk scoring.



How do we calculate the permanence score?

The permanence score leverages a range of observational and modelled data, meaning we are able to assess historically and into the future under different IPCC emissions pathways. The analysis utilizes cutting-edge scientific standards in conjunction with sub-national conditions and project-specific activities.



Burned Area Vegetation Health

Fire Danger SSP5-8.5 SSP1-2.6

Drought Severity SSP1-2.6 SSP5-8.5

Note: the data displayed is real but the underlying index data has been manipulated for the sake of visualization, not interpretation.



Co-benefits score

What is it?

Sylvera's co-benefits rating examines whether the project is implementing activities to support local biodiversity and communities, as well as the scale and likely impact of these activities.

How do we assess the co-benefits of Improved Cookstoves credits?

Sylvera measures the impact Improved Cookstoves project activities have on biodiversity. We leverage data provided by project developers, IUCN data, and IBAT data.

When assessing community impact, we utilize data disclosed by project developers and the Sustainable Development Goals (SDG) framework to triangulate a project's community impact.

An example of a Improved Cookstoves projects contribution to community:

Subsidized ICS available to households; efficiency gains reduce fuel usage Households savings on fuel costs and time spent collecting fuel

C





Potential to reduce indoor air pollution



BIODIVERSITY

THREATS

We assess whether the project is located in a country or region with a high percentage of conservation area.

BIODIVERSITY PROTECTION

We assess the extent to which the project has contributed to biodiversity conservation. ICS projects can help contribute to conservation efforts by reducing fuel demand in countries where forests are degraded for biomass fuels. ICS projects generally do not conduct specific conservation activities or monitor conservation outcomes.

COMMUNITIES

SUSTAINABLE DEVELOPMENT GOALS

We independently identify which UN SDGs the project is contributing towards by assessing the activities implemented by the project. The main project activity, promoting ICS uptake, often has inherent benefits related to time and cost savings from fuel efficiency gains.

SCHEME

We determine whether the scheme is novel or ongoing, and if it goes beyond activities currently implemented in the region. We also assess whether the project makes a foundational contribution to activities that support SDGs, whether such activities promote sustained community engagement, and if contributions are monitored.

IMPACT

We determine the relative impact of activities on local communities by scaling the SDG impact against country-level performance towards achieving the SDGs and the size of the population affected.



Interpreting the additionality score



Indicates very high confidence that a project is additional.

Example: The project has a very low risk of over crediting. There is a significant difference in activities between the "business as usual (BAU)" and the "with project" scenario. The project activities implemented were a direct result of the revenue derived from the carbon project.



Indicates high confidence that the project is additional.



Indicates the project is likely additional.

Example: There is potential risk of over crediting. There is a difference in activities between the "business as usual (BAU)" and the "with project" scenario. The projects activities implemented may be a direct result of the carbon revenues.



Indicates uncertainty about the project's additionality claim.



Indicates we found a serious red flag questioning the project's claims of additionality.

Example: The project has a high likelihood of severe over crediting and/or the activities implemented to increase carbon stock would have occurred in the absence of carbon revenues.



Interpreting the permanence score



Indicates very high permanence and low risk, the project carbon credits are very likely to remain valid long-term.

Example: Across all pillars of loss, likelihood and severity of carbon stock loss are low. The project also implements effective mitigation activities.



Indicates high permanence, the project carbon credits are likely to remain valid long-term.



Indicates moderate permanence, the project carbon credits may remain valid long-term.

Example: No pillar of loss is above 'Moderate' risk.



Indicates low permanence, the project carbon credits are unlikely to remain valid long-term.



Indicates very low permanence and high risk, the project carbon credits are highly unlikely to remain valid long-term.

Example: At least one pillar of loss component has scored as 'Extreme' or more than four components have scored as 'High' risk.



Interpreting the co-benefits rating





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To learn more about Sylvera, <u>contact us</u>.

