



UNDERSTANDING CCQI SCORES

Household Biodigesters

September 2023

Version 1.0

Key CCQI findings

Emission reductions achieved through the installation of household biodigesters have a high likelihood to be additional. Carbon credit revenues often remove key barriers that hinder market uptake. Applying the available quantification methodologies, however, likely leads to an overestimation of emission reductions. For projects that claim emission reductions from reducing the use of non-renewable biomass, overestimation risks are particularly high. This subgroup of projects also has material non-permanence risks that carbon crediting programs currently do not address. There are other cooking technologies with a lower emissions impact, but the project type facilitates progress on many Sustainable Development Goals.

What is this project type about?

Generation of biogas by anaerobic digestion of livestock manure, and possibly other household waste such as kitchen waste, through household size biodigesters. The biogas is used by households for cooking. The project type may include a compost unit that utilizes the fermented sludge from the biodigester to produce organic fertilizer. The project type reduces emissions by (i) avoiding methane emissions from the uncontrolled decomposition of livestock manure and (ii) by reducing the use of firewood or fossil fuels for cooking activities. Projects are located in rural areas in developing countries.

Carbon market background

Among the major carbon crediting programs, the Clean Development Mechanism (CDM), Gold Standard (GS) and Verified Carbon Standard (VCS) currently allow registration of the project type. It enjoys popularity because of its focus on communities and sustainable development benefits. Projects take place in developing countries only.

Projects sometimes are embedded in national household biodigester programs that provide an integrated approach for rolling out the technology and establishing required maintenance functions.

CCQI score summary

Additionality/Vulnerability



Quantification Methodologies



CDM AMS-I.C
Version 21.0

CDM AMS-I.E
Version 13.0



GS TPDDTEC
Version 3.1

GS AMB
Version 1.0

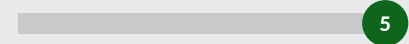
Non-permanence



Compatibility with net zero



SDG Impacts



Double issuance due to indirect overlaps between projects



Why do I see a range of scores for some quality objectives?

In these cases, scores differ between carbon crediting programs, quantification methodologies, countries or other circumstances. The range represents the spectrum that applies for all possible combinations.

CCQI resources

- CCQI Methodology & Definitions
- FAQ on our assessments
- Directory of assessment sheets

www.carboncreditquality.org



Main factors driving project type scores

Additionality/Vulnerability

Here we assess the likelihood that the mitigation activity typically would not have taken place in the absence of the added incentive created by the carbon credits (additionality).

In cases where the market for the type of carbon credit has collapsed (e.g., CDM for some project types), we assess whether the mitigation activity typically is at risk of discontinuing greenhouse gas abatement without ongoing revenues from carbon credits (vulnerability).

How do other project types score?



Graph shows the range of scores for nine project types assessed by CCQI.



Carbon credit revenues likely remove key barriers

Household biodigester bring many environmental and economic benefits. Yet, market uptake is often low. The main reasons for this are households' unfamiliarity with the technology as well as a lack of financial resources to install biodigesters. Carbon credit revenues very likely contribute to overcoming these barriers. They allow project developers to subsidize prices of biodigesters and help conduct awareness raising campaigns that showcase the technologies' advantages compared with other modes of cooking. Revenues can also help training a network of entrepreneurs who can provide after-sales services such as maintenance and repair which are critical to ensure longevity of the equipment.

Carbon markets sometimes replace or complement international donor programs that initially subsidized the introduction of biodigesters. This is unlikely to negatively impact the additionality of projects, as the deployment of biodigesters can drop substantially after the end of donor support and does not recover without reinstating price subsidies.

Differences in carbon crediting programs provisions to assess whether project developers considered carbon credits when making their investment decision are responsible for the range of scores for this criterion.

Quantification Methodologies



Methodologies likely overestimate emission reductions

Carbon crediting programs adopt methodologies for calculating the emission impact of a project. The methodologies prescribe, inter alia, equations, data sources and monitoring approaches. Here we assess whether

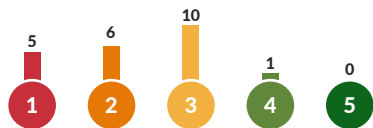
Our assessments find that the application of all analyzed methodologies likely leads to an overestimation of emission reductions. The reasons for this overestimation risk and the degree of overestimation vary between subgroups of projects. The central premise of biodigester projects is that using biogas





quantification methodologies mitigate overestimation risks by applying conservative approaches for estimating emission reductions.

How do methodologies for other project types score?



Graph shows the score distribution for all 23 quantification methodologies assessed by CCQI.

for cooking allows reducing the consumption of baseline fuels. These include fossil fuels, firewood, or charcoal. Some projects also claim avoided methane emissions, as feeding biodigesters with manure avoids its uncontrolled decomposition.

Overestimation risks are very high for projects that claim emission reductions from reducing the consumption of non-renewable biomass in form of firewood or charcoal. Biomass is non-renewable if the harvest rate in the region exceeds annual growth rates. All methodologies require that project developers determine how much of the firewood that households collect is non-renewable. This so-called fraction of non-renewable biomass is a key input value for calculating emission reductions, but difficult to estimate. Applying the procedures prescribed in *CDM AMS-I.E* as well as *GS TPDDTEC*, most projects assume that 80 percent or more of collected firewood is non-renewable. Modelling results of independent researchers based on satellite data however suggest that a global average of 30 percent is more realistic. This discrepancy could lead to an overestimation by up to several hundred percent. In 2022, the CDM introduced a global default value of 30 percent, but its application is optional, allowing project developers to continue to calculate their own values. The new GS methodology AMB does not provide a default value and allows project developers to determine the value using the approaches of the CDM methodologies.

For projects that claim emission reductions from replacing fossil fuels, the overestimation risk is lower, with approaches likely leading to an overestimation of 10 to 30 percent. One reason for potential overestimation is that all methodologies neglect several emission sources. The most prominent sources include leakage due to biomass use and methane emissions from the digestate, a left-over product of the digestion process. For *AMS-I.C*, an additional overestimation risk stems from the assumption that households would use the baseline stoves at their maximum capacity. We therefore estimate that the degree of overestimation for this methodology is likely larger than 30 percent.

For projects that claim avoided methane emissions we estimate that applying the approaches in the methodologies likely lead to an accurate estimation of methane emission reductions. We conclude however that there is a very high uncertainty in quantifying these emission reductions, with the degree of uncertainty being larger than ± 50 percent.





Non-permanence

Non-permanence means that emission reductions or removals achieved by a project are later reversed e.g., due to a natural disaster or project mismanagement.

We assess whether the project type has significant non-permanence risks.

For project types that do have significant non-permanence risks we assess the robustness of carbon crediting program provisions to address these risks.

How do other project types score?



Graph shows the range of scores for nine project types assessed by CCQI.



Projects reducing the use of non-renewable biomass have material non-permanence risks that carbon crediting programs do not address

Non-permanence risk differ between subgroups of the project type, leading to a wide range of scores.

For projects that claim emission reductions from reducing the consumption of non-renewable biomass there is a material non-permanence risk. These projects claim emission reductions from preserving carbon stocks in forests in the project area because of households consuming less firewood. If wildfires or other events degrade or destroy these forests, these events lead to carbon being released back to the atmosphere. None of the carbon crediting programs addresses this risk for this project type.

There are no material non-permanence risks for the subgroups of projects replacing fossil fuels or avoiding methane emissions.

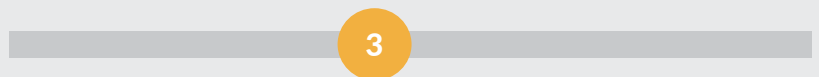
Compatibility with net zero

Here we assess whether the technology or practices applied by the project type facilitate the transition towards net zero emisisions.

How do other project types score?



Graph shows the range of scores for nine project types assessed by CCQI.



Other cooking technologies have lower GHG emission impacts

Installing household biodigesters helps rural households with livestock to deploy a cleaner technology for cooking. Other cooking technologies have, however, a lower GHG emissions impact. This includes solar cookers or electric cooking with renewable electricity. Household biodigesters can involve significant continuous GHG emissions from methane leaks and venting. They therefore pose some risk for locking-in continued emissions; however, we do not consider this risk significant as biodigesters do not require a huge investment and replacing or dismantling them when new technology becomes available is easy.





SDG Impacts

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Biodigesters facilitate progress on many SDGs

Here we assess whether the project type contributes to the achievement of the Sustainable Development Goals (SDGs).

Note that projects implemented in Small Island Developing States (SIDS) and Least Developed Countries (LDCs) receive an upgrade to the score by one point due to the special circumstances of these countries.

How do other project types score?



Graph shows the range of scores for nine project types assessed by CCQI.

Household biodigester can help make progress on several SDGs. They turn otherwise unutilized manure and kitchen waste into biogas, thereby increasing the share of renewable energy and recycling organic waste. The project type improves security and reliability of energy for households that depend on traditional energy carriers such as fuelwood. A by-product of biodigesters is fermented sludge that can be used as an organic fertilizer replacing the application of synthetic fertilizers, thus fostering sustainable agriculture and agricultural productivity at the same time. Jobs are typically created along the biodigester value chain and households save on fossil fuel expenses. Cooking with biogas significantly reduces household air pollution when compared to fuelwood or kerosene cookstoves. Furthermore, households spend less time to collect fuelwood and for cooking. Especially women benefit from the latter and from reduced health risks associated with cooking indoors. Using biogas to replace fuelwood also reduces pressures on forest.

Double issuance due to indirect overlaps between projects

Here we assess whether the project type has low risks to overlap with other project types in the carbon market

For project types where we identified a high risk, we also assess if carbon crediting programs have robust provisions in place that avoid that the same credit is issued twice for the same emission reduction in the case

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Carbon crediting programs might accidentally issue credits for the same emission reductions to household biodigester and forest projects

The risk of double issuance is only relevant for the subgroup of projects claiming emissions from reducing the consumption of firewood. For all other subgroups this risk does not apply, explaining the range of scores.

Double issuance can happen when a household biodigester and a forestry project operate in the same area. The biodigester project reduces the use of non-renewable biomass





that two projects overlap. This could happen if several projects count the emission reductions or removals from the same emission source or sink.

This is a sub-criterion of the criterion 'double issuance', which forms one part of our assessments under for the quality objective 'double counting'.

How do other project types score?



Graph shows the range of scores for nine project types assessed by CCQI.

and thereby preserves carbon stocks in surrounding forest areas. If a project to reduce deforestation or improve forest management is implemented on the same forest area, it might claim the same emission reductions.

None of the assessed carbon crediting programs (CDM, GS, VCS) applies systematic checks for identifying and avoiding overlaps between household biodigester and other carbon market projects.





Starting points for further due diligence

This factsheet summarizes key risk factors for the quality of carbon credits from this project type, as identified in CCQI's detailed assessments. Individual projects might outperform any of our scores by making project-design choices that mitigate these risks. CCQI scores therefore do not apply to individual projects. They can however inform further due diligence when assessing the quality of individual projects. Questions to ask might include:

- Does the project assume a fraction of non-renewable biomass that is backed by independent scientific literature for the respective region?
- Are the values selected for other parameters when calculating emission reductions consistent with conservative default values, as provided by the methodology, or does the project use significantly less conservative values?
- Does the project area overlap with a forestry project? If yes, do both projects take measures to avoid the risk of double issuance?

For assessments of specific projects, you may contact specialized rating agencies such as [BeZero](#), [Calyx Global](#) or [Sylvera](#).



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About CCQI

The Carbon Credit Quality Initiative (CCQI) was established to provide free, transparent information on the quality of different types of carbon credits, enabling users to understand what types of carbon credits are more likely to deliver actual emission reductions as well as social and environmental benefits.

CCQI was founded and is managed by Environmental Defense Fund (EDF), World Wildlife Fund (WWF-US) and Oeko-Institut, a leading European research and consultancy institution working for a sustainable future. Scores published by CCQI are derived from applying the CCQI assessment methodology. The assessment is led by Oeko-Institut, with support from experienced carbon market experts from Carbon Limits, Greenhouse Gas Management Institute (GHGMI), INFRAS and Stockholm Environment Institute (SEI). Draft results are reviewed by the full CCQI team before public release. All experts involved in CCQI have deep expertise in carbon markets and are not employed by project developers or carbon crediting programs.

This factsheet was commissioned by



www.allianz-entwicklung-klima.de

How does CCQI assess quality?

CCQI assesses quality aspects of different types of carbon credits. The following main features define a type for our assessments:

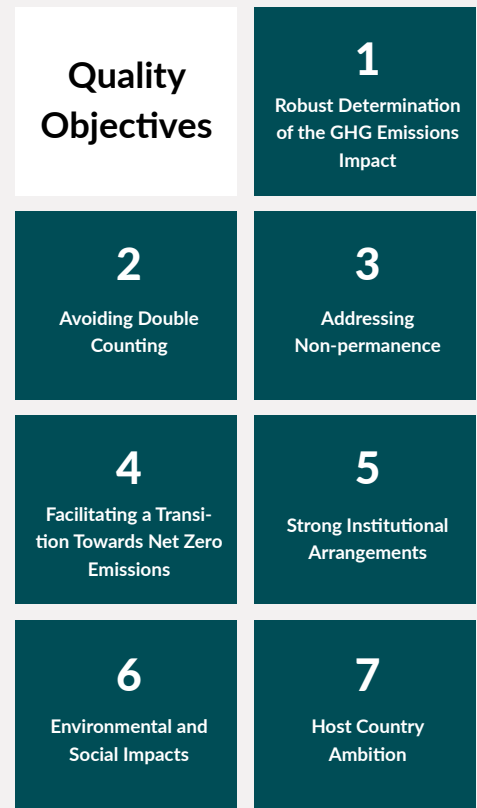
- The type of project (e.g., landfill gas utilization)
- The carbon crediting program (e.g., Verified Carbon Standard)
- The quantification methodology used to estimate emission reductions for the project activity
- The country in which the activity takes place

We assess each type against several criteria, sub-criteria and indicators that are clustered around seven quality objectives.

Each assessment follows our publicly available methodology.

In this factsheet we present results for selected quality objectives, criteria and sub-criteria whose scores depend primarily on characteristics of the type of project.

To see how this project type scores against all our criteria, explore our scoring tool.



VISIT CCQI SCORING TOOL

www.carboncreditquality.org/scores.html



How to interpret CCQI Scores?

Our scores use an interval scale from 1-5, with 5 representing the highest score.

Scores are risk-based and indicative of the confidence or likelihood that the assessment subject meets the quality objective.

We do not provide an aggregated score for types of carbon credits to provide users with a nuanced picture on different quality aspects.

CCQI Score Scale

Level of confidence that the assessment subject meets the criterion or quality objective

