Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

Application of the Oeko-Institut/WWF-US/ EDF methodology for assessing the quality of carbon credits

This document presents results from the application of version 3.0 of a methodology, developed by Oeko-Institut, World Wildlife Fund (WWF-US) and Environmental Defense Fund (EDF), for assessing the quality of carbon credits. The methodology is applied by Oeko-Institut with support by Carbon Limits, Greenhouse Gas Management Institute (GHGMI), INFRAS, Stockholm Environment Institute, and individual carbon market experts. This document evaluates one specific criterion or sub-criterion with respect to a specific carbon crediting program, project type, quantification methodology and/or host country, as specified in the below table. Please note that the CCQI website Site terms and Privacy Policy apply with respect to any use of the information provided in this document. Further information on the project and the methodology can be found here: www.carboncreditquality.org

Sub-criterion:	1.3.2 Robustness of the quantification methodologies applied to determine emission reductions or removals
Project type:	Industrial biodigesters fed with livestock manure
Quantification methodology:	CAR: U.S. Livestock Project Protocol – Version 4.0
Assessment based on carbon crediting program documents valid as of:	15 May 2022
Date of final assessment:	31 January 2023
Score:	3

Contact
info@oeko.de
www.oeko.de

Head Office Freiburg
P. O. Box 17 71
79017 Freiburg

Street address
Merzhauser Straße 173
79100 Freiburg
Phone +49 761 45295-0

Office Berlin
Borkumstraße 2
13189 Berlin
Phone +49 30 405085-0

Office Darmstadt
Rheinstraße 95
64295 Darmstadt
Phone +49 6151 8191-0

Assessment

Relevant scoring methodology provisions

The methodology assesses the robustness of the quantification methodologies applied by the carbon crediting program to determine emission reductions or removals. The assessment of the quantification methodologies considers the degree of conservativeness in the light of the uncertainty of the emission reductions or removals. The assessment is based on the likelihood that the emission reductions or removals are under-estimated, estimated accurately, or over-estimated, as follows (see further details in the methodology):

Assessment outcome	Score
It is very likely (i.e., a probability of more than 90%) that the emission reductions or removals are underestimated, taking into account the uncertainty in quantifying the emission reductions or removals	5
It is likely (i.e., a probability of more than 66%) that the emission reductions or removals are underestimated, taking into account the uncertainty in quantifying the emission reductions or removals OR The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) and uncertainty in the estimates of the emission reductions or removals is low (i.e., up to ±10%)	4
The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) but there is medium to high uncertainty (i.e., ±10-50%) in the estimates of the emission reductions or removals OR It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, but the degree of overestimation is likely to be low (i.e., up to ±10%)	3
The emission reductions or removals are likely to be estimated accurately (i.e., there is about the same probability that they are underestimated or overestimated) but there is very high uncertainty (i.e., larger than ±50%) in the estimates of the emission reductions or removals OR It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, and the degree of overestimation is likely to be medium (±10-30%)	2
It is likely (i.e., a probability of more than 66%) or very likely (i.e., a probability of more than 90%) that the emission reductions or removals are overestimated, taking into account the uncertainty in quantifying the emission reductions or removals, and the degree of overestimation is likely to be large (i.e., larger than ±30%)	1

Information sources considered

1 CAR: U.S. Livestock Project Protocol – Version 4.0 (and references therein)

2 CDM ACM0010 – Version 8.0

3 IPCC 2006 Guidelines for National Greenhouse Gas Inventories. Volume 4, Chapter 10 Emissions from livestock and manure management.

4 Duren et al. 2019: California's methane super-emitters, Nature volume 575, pages180–184. https://doi.org/10.1038/s41586-019-1720-3

5 Zhang et al. 2013: Carbon emission reduction potential of a typical household biogas system in rural China, Journal of Cleaner Production, Volume 47, May 2013, Pages 415-421. https://doi.org/10.1016/j.jclepro.2012.06.021

Assessment outcome

The quantification methodology is assigned a score of 3.

Justification of assessment

Project type

This assessment refers to the project type "Industrial biodigesters fed with livestock manure". The project type is characterized as follows:

"Generation of biogas by anaerobic digestion of livestock manure. The biogas is combusted for the generation of power and/or heat, which can be fed into the grid or used on-site. A smaller fraction of the gas may be flared. The project type reduces emissions by (i) avoiding methane emissions from the uncontrolled decomposition of livestock manure and (ii) by displacing more greenhouse gas intensive energy generation based on fossil fuels."

Projects are based in US farms that raise livestock. In the baseline the manure is treated and stored mainly under anaerobic conditions, which leads to uncontrolled methane emissions. Applicable are existing facilities as well as Greenfield facilities.[1]

The focus of the following assessment is on elements with the potential for over- and underestimation of emission reductions and on elements that introduce uncertainty. These elements are numbered and summarized in Table 3.

Emission sources considered in calculating emission reductions

Table 1 compares the emission sources included for different methodologies. The CAR methodologies list all potential emissions sources and include most sources to determine emission reduction (see Table 1). The methodologies do not account for emission reductions associated with the possible use of methane for energy generation, which is conservative. They also do not consider changes in nitrous oxide emissions and methane leakage emissions. These points are discussed in more detail below.

[1] Greenfield facilities are allowed if the project developer can demonstrate that there are no restrictions to the construction and operation of an open, uncontrolled, anaerobic manure storage system.

Table 1 Comparison of emissions sources considered in manure management methodologies

Emissions from	CDM ACM0010 (v8)	CAR Livestock (USA v4.0 and Mexico v2.0)	CDM AMS-III.D (v21)
Baseline Emissions			
Baseline waste treatment processes	CH_4: Yes N_2O: Yes	CH_4: Yes **N_2O: No**	CH_4: Yes **N_2O: No**
Electricity or thermal energy generation or use of natural gas in the baseline scenario	CO_2: Yes	**No**	CO_2: Yes[2]
Upstream emissions of fossil fuels used in the baseline scenario	No	No	No
Project Emissions			
Project waste treatment processes / Effluent treatment system	CH_4: Yes N_2O: Yes[3]	CH_4: Yes **N_2O: No**	CH_4: Yes[4] **N_2O: No**
Physical leakage or venting of gas from the biodigester	CH_4: Yes (phys. leakage)	CH_4: Yes (**venting** and phys. leakage)	CH_4: Yes (phys. leakage)
Incomplete destruction of methane from combustion or flaring of the biogas	CH_4: Yes	CH_4: Yes	CH_4: Yes
Electricity and thermal energy use	CO_2: Yes	CO_2: Yes	CO_2: Yes
Project construction and decommissioning	No	No	No
Leakage Emissions			
Disposal of treated manure on land	CH_4: Yes N_2O: Yes[5]	**CH_4: No** **N_2O: No**	**No**
Storage of liquid or solid[6] effluent (outside project boundary)	CH_4: Yes	CH_4: Unclear	CH_4: Yes
Composting of the digestate	CH_4: Yes N_2O: Yes	CH_4: Yes **N_2O: No**	CH_4: Yes N_2O: Yes
Leakage only considered if in total positive	Applied	Not applied	Not applied
Overall emission reductions			
Minimum value of modelled and measured emission reduction	Applied	Applied	Applied

2 AMS-III.D refers to AMS-III.H, where utilization of the recovered biogas is eligible.
3 Direct and indirect N_2O emissions
4 The effluent from the biodigester shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of “AMS-III.AO Methane recovery through controlled anaerobic digestion". In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured.
5 Incl. application, leaching and run-off
6 Solid effluent usually in a solid waste disposal site.

OE1 Project construction and decommissioning

CAR's U.S. Livestock Project Protocol does not account for project emissions due to the construction and decommissioning of the project equipment, arising mainly from the emissions embodied in steel and cement. There are few studies that quantify the impact. For household scale biodigesters in China, Zhang et al. 2013 calculate that the impact is equivalent to 1.8 years of emission reductions, which would correspond to 12% over a lifetime of 15 years. As industrial biodigesters are much larger and thus require significantly less steel and cement per volume of manure, we assume that a much smaller fraction applies for industrial scale digesters.

UE1 Neglecting emission reductions from utilization of methane

The project may utilize methane for energy generation and thus substitute GHG emissions associated with fossil fuel combustion. Under the methodology, projects do not receive carbon credits for this fossil fuel substitution. This leads to an underestimation of emission reductions by approximately 10-15% if projects use methane (and do not simply flare it).[7] We do not have data on how many projects in fact use methane. We assume that the fraction is considerable, as it is usually economically sensible to use the methane. Note that this element would not lead to underestimation for Californian projects (approx. 15% of credits). This is because those projects would be typically covered by California's emission trading scheme, thus not actually reduce emissions under the overall cap.

UE2 Neglecting upstream emissions from fossil fuels used in the baseline scenario

CAR's U.S. Livestock Project Protocol does not account for the upstream emissions associated with production of fossil fuels used in the baseline scenario for electricity or thermal energy generation. According to the World Resources Institute, upstream emissions account for 5-37% of fossil fuel's emissions, depending on the type and origin of the fossil fuel.[8] As highlighted above (UE1), CO_2 emissions from fossil fuel combustion account for approximately 10-15% of total baseline emissions. Overall, neglecting upstream emissions from the associated fossil fuel productions thus underestimates overall emission reductions but to a relatively small extent (up to about 5%, depending on the type and origin of the fossil fuels).

U1 Neglecting changes in nitrous oxide emissions

The changes in manure management system under the project will affect the level of nitrous oxide emissions. The methodology does not account for those changes, claiming that this is conservative and that there is no reliable data. The conversion of organic nitrogen in livestock waste to nitrous

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7 A ton of avoided LFG methane has a global warming potential of 25 according to the 4th IPCC assessment report and the value is 28 according to the 5th IPCC assessment report. In addition to avoiding methane emissions, the LFG is used to replace fossil fuels. If e.g. fossil methane is replaced, this lowers fossil CO_2 emission by approx. 2,5 tCO_2 per tCH_4. Emission reductions are thus underestimated by approximately 10% if the replacement of fossil fuels is not accounted for. Putting these two numbers in relation shows that substitution contributes 10%. In case methane replaces coal, the fraction is rather 15%, as coal's emissions per energy content are approximately 65% higher than for methane (not considering different efficiencies).

8 https://www.wri.org/data/upstream-emissions-percentage-overall-lifecycle-emissions (17 October 2022). This number does not include refining. Furthermore, the construction of electricity generation plants etc. is not accounted for.

oxide is complex and depends on numerous influencing factors. Data is thus indeed not reliable, and it is unclear how significant possible changes in nitrous oxide emissions are. Data from the application of the quantification methodology ACM0010, which accounts for the change in nitrous oxide emissions, suggests that nitrous oxide emissions could be higher in the project case then in the baseline scenarios, thus lowering overall emission reductions.[9] There is therefore no indication that omitting nitrous oxide emissions is conservative (as claimed by CAR). Due to lack of reliable data, we consider this aspect as an element that contributes to uncertainty.

Determination of baseline emissions

Baseline methane emissions are modelled using a variety of default parameters as well as data on the average population of livestock per category (corresponding mostly to the Tier 2 approach in the 2006 IPCC Guidelines for national GHG inventories and their 2019 Refinement).

The following table lists relevant parameters.

[9] Nitrous oxide emissions are, for example, higher in the project case than in the baseline scenario in Gold Standard's project with the ID 2561 (according to the publicly available calculation sheet from 25/08/2021).

Table 2 Baseline methane emissions: relevant input parameters

Element	Usual Source	Example	Uncertainty of element	Overall impact on under- or overestimation
Average population of livestock category	Measured	100 grow/finish swine	Small	Small
Average mass of livestock	Measured or default for livestock category	70 kg animal mass (grow/finish swine)	Small	Small
Volatile solids (VS) produced by livestock category on a dry matter basis.	Several default values for different livestock categories (and partly states[10])	5.36 kgVS /day/1000 kg animal mass (grow/finish swine)	Medium-High	Medium-High
Percent of manure sent to manure storage/treatment system from livestock category	Measured	90%	Small	Small
Maximum methane producing capacity of manure for livestock category	Several default values for different livestock categories[11]	0.48 m^3 CH_4/kg VS (grow/finish swine)	Medium	Medium
Management and design practices factor[12]	Fix default value	Always 0.8	High	High
Methane conversion	Based on a “van't Hoff-Arrhenius equation”	42%/16% per month for 20°C/10°C	Medium-High	Medium
Methane conversion factor for non-anaerobic storage/ treatment system in the baseline	Several default values for different systems and temperatures	4% Solid storage at 20°C	Medium	Low

U2 Modelled baseline emissions

In general, methane emissions from manure management in the baseline are uncertain, as they arise from complex biological processes. These depend on many factors, including animal species, climate, region, livestock productivity system, the extent of anaerobic conditions, or the retention time of the organic materials.

The approach under CAR's U.S. Livestock Project Protocol to model baseline methane emission is comprehensible and uses a mix of measured parameters and best guess default values. It is beyond the scope of this assessment to evaluate the appropriateness and uncertainty of each parameter in

10 For Dairy Cows, Heifers, Heifers-Grazing and Cows-Grazing Volatile Solid Default Values are differentiated by state. Especially for Dairy Cow the difference is substantial (up to 40%)

11 May also be determined project specific

12 This factor reflects the difference between the theoretical modelled biological activity and empirical measurement of biological activity due to removal of liquid or other management practices that result in loss of volatile solids from the treatment system.

detail. However, parameters are often based on rather old data or on expert judgment (e.g. the 2006 IPCC Guidelines which in turn is based on even older data). There is thus substantial uncertainty related to the modelling of baseline emissions. Table 1 summarizes available information and shows that several parameters have considerable uncertainty.

The 2006 IPCC Guidelines and the CDM methodology ACM0010 use a single methane conversion factor (per management system and average yearly temperatures[13]) to determine the fraction of methane that is generated in relation to the maximum methane producing capacity. CAR's approach is more complex: It uses a "van't Hoff-Arrhenius equation" which calculates monthly methane conversion based on monthly temperatures.[14] For example, for a monthly temperature of 20°C/10°C the resulting monthly conversion is 42%/16%. In addition, CAR prescribes a "Management and design practices factor" of 0.8, which is multiplied with the degradable volatile solids that enter the manure management system.

We could not quantitatively compare the overall impact of CAR's versus ACM0010's approaches, but both approaches involve significant uncertainty. For the assessment of CDM's ACM0010, we derived an estimated of the overall uncertainty of at least 40% for methane emission. A similar magnitude could also apply to CAR's approach.

To account for the uncertainty, the methodology requires that the following two values shall be determined for each reporting period[15] and the lower value shall be used for quantifying emission reductions:

- The modelled methane baseline emissions subtracted by project emissions due to physical methane leakage or venting from the anaerobic digester; and
- The quantity of methane produced in the biodigester.

The intent of this approach is using the measured methane generation under the project activity to cap the modelled baseline emissions. However, it seems likely that methane generation under the project is larger than in the baseline scenario, as a biodigester's purpose is to produce as much methane as possible. This approach is thus primarily a safeguard against significant overestimation of modelled baseline emissions. We do not have data with respect to how often this cap is applied. Assuming that a project biodigester has a methane conversion factor of 90%, whereas it is 60-80% in the baseline manure management system[16], the cap would only apply if the overestimation were approximately 12%-50%. The approach is therefore not deemed as an element that contributes to underestimating emission reductions but could reduce the extent of potential over-estimation of baseline emissions.[17]

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13 The 2019 IPCC Refinement proposes a more sophisticated approach, involving retention times.

14 It considers that only a certain fraction of the volatile solids that enter the biodigester in a given month (or remain there from last month) are converted to methane in that month. However, the idea behind the "van't Hoff-Arrhenius equation" is not entirely clear to us. As degradable volatile solids that have not been degraded in a given month, simply carry over to the next month, the equation seems to only influence the temporal distribution of emissions for seasonal temperatures changes but would not influence overall emissions. In the long run, it seems that the temperature does not have any impact on emission levels (whereas the methane conversion factor of ACM0010 decreases with temperature).

15 In the CDM methodology ACM0010, values have to be compared each year.

16 Values loosely based on IPCC 2019, table 10.17

17 The safeguard is the less effective the lower the methane conversion factor of the baseline manure management system.

To sum up element U2: We assume that the uncertainty of methane baseline emissions is significant and likely to be at least 40-50%. However, the impact of this uncertainty might be mitigated to some extent due to the safeguard of using the lower value between the modelled methane emissions and actual methane generation under the project, as described above.

U3 Greenfield facilities

The methodology also covers greenfield livestock facilities if the project developer can demonstrate that there are no restrictions to the construction and operation of an open, uncontrolled, anaerobic manure storage system. In this case the methodology offers a set of baseline design options. The fact that greenfield facilities are applicable introduces additional uncertainty: while for existing facilities it can be empirically observed whether an anaerobic lagoon was in place, for new facilities this cannot be observed but would need to be assessed based on other information.[18] However, we assume that greenfield facilities make up a small fraction of projects such that the impact on overall emission reduction across all projects is not large.

Determination of project emissions

Project emissions include several components which are summarized in the following table.

18 There are several options how an anaerobic lagoon could be designed, including the depth and surface area of the anaerobic lagoon or the residence time of the organic matter. Those design options result in different methane emissions. The available default values largely differentiate between those design options.

Table 3 Project emissions: relevant input parameters

Element	Relevant Parameters	Usual Source	Example	Uncertainty of element	Impact on under or overestimation
1. The amount of methane created by the BCS that is…	Methane flow	Measured	100 tCH4	Small	Small
a) …not collected but emitted directly	Methane collection efficiency of the BCS	Several default parameters for different BCS types	95% for an anaerobic lagoon with a bank-to-bank, impermeable cover	High	Medium to High
b) … collected but not destroyed	Methane destruction efficiency	Several default parameters for different destruction devices	95% for open flares	Small to Medium	Small
1 c) The amount of methane that is vented	Several	Mainly measured parameters	20 tCH4	High	Small
2) For fraction of effluent that is treated under anaerobic conditions: Methane emissions[19]	Percentage of VS that exits biodigester as compared to entering it	Default parameter	30%	High	High
3) For fraction of effluent of effluent that is treated under aerobic conditions: Methane emissions	Methane conversion factor MCF	Default parameters	MCF=4% for Solid storage at 20°C	High	Low-Medium
Fraction of effluent entering 2) vs entering 3)	Unclear				
4) Methane emissions sources other than from the biodigester and its effluent	Fraction of manure entering other systems	Measured	15%	Small	Unclear
	Methane conversion factor of other system	Several default parameters	50% Centrifuge	Unclear	Unclear

[19] 2) and 3) are analogous. However, in 2) it is assumed that the environment is fully anaerobic such that the volatile solids are converted to methane according to their full potential. In 3) the environment is aerobic such that a low methane conversion factor is assumed.

U4 Modelled project emissions

Project emissions are also determined based on models with various input parameters that are either measured parameters or default values. The approach is comprehensive and comprehensible (apart from element 4). Methane emissions are inherently uncertain, as they arise from complex biological systems. Parameters that enter the modelling are often based on rather old data or on expert judgment (e.g. IPCC Guidelines). A detailed assessment of the individual elements is beyond the scope of this document.

We assume that a key parameter affecting overall emission reductions is methane that physically leaks from the biodigester. In this respect, the methodology uses default values (for example a collection efficiency of 95% for an anaerobic lagoon with a bank-to-bank, impermeable cover). Provided that a biodigester is well-maintained, these default values seem plausible. However, if biodigesters are not well-maintained or frequently vented, actual physical leakage rates might be higher. Duren et al. 2019 used airborne imaging spectrometer to detect methane plumes in California. They found that emissions are not equally distributed among installations but that certain installations are super emitters. While their focus was methane emitters in general, they explicitly mention manure management and anaerobic digesters as potential problems. There is however no data which would allow us to quantify the uncertainty of this element.

Another key factor are methane emissions from treatment of the effluent. CAR assumes that if degradable volatile solids exit the biodigester as effluent into an anaerobic treatment system, a fixed fraction of 30%[20] of the input is contained in the effluent and then fully converted to methane, leading to project emissions.

Determination of leakage emissions

U5 Neglecting most leakage emissions

Nitrous oxide and methane emissions outside the system boundary might change (e. g. emissions from land applications) if management practices change. This is the reason that ACM0010 does consider those leakage emissions but stipulates that they may only be accounted for if they reduce claimed emission reductions. CAR excludes those leakage sources altogether, with the justification that these are not relevant or that exclusion is conservative. Due to lack of data, it is not possible to estimate if the neglected leakage sources would be overall positive or negative. We thus consider this as an element that contributes to uncertainty.

Summary and conclusion

Table 3 summarizes the assessment. For each of the previously discussed elements it estimates the potential impact on emission reduction quantification.

[20] It is unclear, why this fraction is not also calculated using the “van’t Hoff-Arrhenius equation”.

Table 4 Relevant elements of assessment and qualitative ratings

Element	Fraction of projects affected by this element[21]	Average degree of under- or overestimation where element materializes[22]	Variability among projects where element materializes[23]
Elements likely to contribute to overestimating emission reductions or removals			
OE1 Project construction and decommissioning	All	Low	Low
Elements likely to contribute to underestimating emission reductions or removals			
UE1 Neglecting emission reductions from utilization of methane	Medium	Medium 10-15%	Low
UE2 Neglecting upstream emissions from fossil fuels used in the baseline scenario	All	Low	High
Elements with unknown impact			
U1 Neglecting changes in nitrous oxide emissions	All	Unknown	High
U2 Modelled baseline emissions	All	High	High
U3 Greenfield facilities	Unknown	Low	Low
U4 Modelled project emissions	All	Medium	High
U5 Neglecting most leakage emissions	All	Medium-High	High

[21] This parameter refers to the likely fraction of individual projects (applying the same methodology) that are affected by this element, considering the potential portfolio of projects. “Low” indicates that the element is estimated to be relevant for less than one third of the projects, “Medium” for one to two thirds of the projects, “High” for more than two third of the projects, and “All” for all of the projects. “Unknown” indicates that no information on the likely fraction of projects affected is available.

[22] This parameter refers to the likely average degree / magnitude to which the element contributes to an over- or underestimation of the total emission reductions or removals for those projects for which this element materializes (i.e., the assessment shall not refer to average over- or underestimation resulting from all projects). “Low” indicates an estimated deviation of the calculated emission reductions or removals by less than 10% from the actual (unknown) emission reductions or removals, “Medium” refers to an estimated deviation of 10 to 30%, and high refers to an estimated deviation larger than 30%. “Unknown” indicates that it is likely that the element contributes to an over- or underestimation (e. g. overestimation of emission reductions in case of an omitted project emission source) but that no information is available on the degree / magnitude of over- or underestimation. Where relevant information is available, the degree of over- or underestimation resulting from the element may be expressed through a percentage range.

[23] This refers to the variability with respect to the element among those projects for which the element materializes. “Low” means that the variability of the relevant element among the projects is at most ±10% based on a 95% confidence interval. For example, an emission factor may be estimated to vary between

Baseline and projects emissions of the manure treatment systems are determined using measured parameters and a staggering amount of default values. The default values seem to reflect best guesses and — as far as data allows — differentiate between livestock, technical systems, regions and temperatures. As methane emissions arise from very complex biological process, even the methodology's rather comprehensive approach cannot account for the variety of influencing factors. For many elements, we could therefore not identify whether the approach leads to an under- or overestimation. The modelling of baseline and project emissions is, however, identified to involve high uncertainty (U2 and U4). In addition, nitrous oxide emissions are neglected in the baseline and project case (U1) and leakage due to changes in methane or nitrous oxide emissions outside the system boundary are not considered (U5). For U2 alone, it plausible to assume that the uncertainty could be at least about ±40. The uncertainties arising from U1, U3 and U4 increase that range.

There are elements that lead to overestimation and underestimation, with the latter having more impact. Thus, the methodology might lead to some underestimation overall. Whether and in how many instances such an underestimation will occur, is uncertain, due to the large uncertainties in the overall emission reductions. We thus do not assume that underestimation is *likely* to occur (i.e., with a probability of 67%), which would qualify for a score of 4. If there would be no bias towards over- or underestimation of emission reductions, the methodology would qualify for a score 2, as we estimate the uncertainty in overall emission reductions to be larger than ±50%. However, noting the slight tendency towards underestimation, we assigned an overall score of 3.

Remark: we also assign an overall score of 3 for ACM0010. In comparison, the CAR methodology features more uncertainty, for example due to U5 (this element is not present for ACM0010). On the other hand, CAR's method has a slightly higher bias towards underestimation. This is because CAR's methodology neglects the emission reductions from utilization of methane whereas ACM0010 allows to account for those reductions (this is partly compensated by the fact that ACM0010 applies a 6% discount of methane emissions from the baseline manure management system, whereas CAR's methodology does not apply a discount factor).

values from 18 and 22 among projects, with 20 being the mean value. "Medium" refers to a variability of at most ±30%, and "High" of more than ±30%.