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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:	1.2 Vulnerability
Project type:	Landfill Gas Utilization
Assessment based on carbon crediting program documents valid as of:	30 June 2021
Date of final assessment:	20 May 2022
Score:	Assessment of market functioning: The CDM market for landfill gas utilization projects is deemed to be collapsed. For the CAR, GS and VCS it is deemed to be functioning. Vulnerability score for the CDM: 1

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Assessment

Relevant scoring methodology provisions

In market situations where the supply of carbon credits from already registered and implemented projects considerably exceeds the current and expected future demand for carbon credits, the purchase of carbon credits does not necessarily trigger further emission reductions. The methodology therefore evaluates for carbon credits in collapsed markets whether the projects would continue to reduce GHG emissions even without carbon credit revenues, or whether they are at risk of discontinuing GHG abatement without these revenues. In the latter case, they are classified as vulnerable projects. The methodology employs a stepwise approach for assessing the vulnerability of the respective project type or individual project:

Step 1: Evaluate whether the relevant market of the carbon credit can be characterized as collapsed (see methodology for further details). Note that currently, this situation only applies to the CDM.

Step 2: Identify potential continuation and discontinuation scenarios. If applied on the project type level a representative sample of projects can be assessed.

Step 3: Evaluate how applicable legal requirements affect the feasibility of the scenarios identified in step 2. Apply this step to both continuation and discontinuation scenarios. Remove scenarios that could not be pursued due to applicable laws and regulations. This step may be applied at project or project type level in the context of a specific host country or at the level of the carbon crediting program (see methodology for further details).

Step 4: Assess financial benefits and costs and rank the remaining scenarios in order of their financial attractiveness by performing a cost-benefit analysis of each scenario. The financial attractiveness of a project depends on whether its income exceeds the operational expenditure in the absence of carbon credits. Only OPEX and benefits are therefore considered in the analysis. Exclude costs and benefits that occur under all scenarios in a uniform manner.

Step 5: Assess whether any of the scenarios faces non-financial barriers that exclude it from being the course of action. For conducting the barrier assessment, the same approach described in section 1.1.4 is applied using an expert judgement. Remove all scenarios that face non-financial barriers and are scored at 5 or 4 from further consideration.

Step 6: Determine the most likely project scenario. The highest ranked remaining scenario is the likely course of action. If this is a continuation scenario, the project is deemed to have a low vulnerability to discontinue GHG abatement (score of 1). If the scenario is a discontinuation scenario, and it is either the only remaining scenario or any other scenarios are financially significantly less attractive, then the vulnerability is deemed to be high (score of 5). In other instances, e.g. where a continuation and discontinuation scenario may be equally plausible, no clear conclusion can be drawn on vulnerability (score of 3).

Degree of Vulnerability	Score
High Vulnerability	5
Vulnerability not conclusive	3
Low Vulnerability	1

Information sources considered

1 CDM Project Search. Data accessed on 04 February 2022 https://cdm.unfccc.int/Projects/projsearch.html

2 Cames, M., Harthan, R. O., Fussler, J., Lazarus, M., Lee, C. M., Erickson, P. and Spalding-Fecher, R. (2016). *How Additional Is the Clean Development Mechanism? Analysis of the Application of Current Tools and Proposed Alternatives*. CLIMA.B.3/SERI2013/0026r. Prepared for DG Clima by Oeko-Institut, INFRAS, Stockholm Environment Institute (SEI), Berlin. https://ec.europa.eu/clima/sites/clima/files/ets/docs/clean_dev_mechanism_en.pdf

3 Warnecke et al. (2019) Robust eligibility criteria essential for new global scheme to offset aviation emissions – Supplementary information https://static-content.springer.com/esm/art%3A10.1038%2Fs41558-019-0415-y/MediaObjects/41558_2019_415_MOESM1_ESM.pdf

Assessment outcome

The project type is assigned a score of 1.

Justification of assessment

Step 1: Per the guidance in the methodology the CDM market is collapsed. There are currently 164 registered landfill gas utilization projects under the CDM. All other markets relevant for this demo-application are considered functioning.

Step 2: The following continuation or discontinuation scenarios are identified:

- Scenario 1: Mitigation activity continues as originally designed and implemented, and at the same scale.
- Scenario 2: Mitigation activity continues but at a smaller scale as maintenance of the landfill gas capturing and utilization equipment will be discontinued leading to the equipment eventually ceasing to function.
- Scenario 3: Mitigation activity discontinues as project owners will cease to operate the landfill gas capturing and utilization equipment.
- Scenario 4: Mitigation activity discontinues as project owners will dismantle the collection and utilization equipment.

Step 3: Some jurisdictions have legal requirements that require collection of landfill gas. For this reason, there is a possibility that new legal requirements are introduced or that existing legal requirements are enforced after the implementation of a landfill gas project. In this case, the mitigation activity might continue. It is difficult to assess, however, how often such a situation could occur. As there is no conclusive outcome on this step, the following steps are applied.

Step 4: As the assessment is conducted on the project type level, the relationship between revenues and OPEX was analysed for a sample of landfill gas utilization projects. The sample was constructed as follows:

- The project databases of the Clean Development Mechanism (CDM), the Climate Action Reserve (CAR), the Gold Standard (GS) and Verra's Verified Carbon Standard (VCS) were searched for the project type land fill gas utilization.
- For the projects identified in each of the registries a search was performed whether they provide the necessary detailed information on their financial viability that is required for performing the assessment. In particular, the assessment requires the following data:
    - A time series of revenues other than from carbon credits over the operational period of the project.
    - A time series of operational expenditures over the operational period of the project
- Only the CDM project search platform provides detailed information on the financial model of projects. The assessment therefore is limited to CDM project only
- There are currently 195 landfill gas utilization projects with active reference numbers accessible through CDM project search. These have varying status with the program (registered, pending publication, withdrawn, etc.).
- A review of key project information for each of the 195 projects showed that only 47 provide the financial information required for performing the assessment. These 47 projects therefore form the input for the data sample constructed for the assessment.
- All projects provide this information as a separate excel sheet which was downloaded for each project.

In constructing the data sample, the following information was collected directly from each excel sheet for each project and transferred in a central excel sheet created for conducting the analysis:

- The project ID
- The project start date
- The host country
- The host country region
- The currency used by the project proponent for the financial model
- The unit used by the project proponent to present financial information (e.g., 10,000 RMB)

In addition to this basic information, for each project the revenues other than carbon credits and operational expenditures were considered. All projects provide this information as a time series over the full operational period of the project. Some projects indicate the actual years for the time series (2007, 2008, 2009, etc.) while other indicate the time period (Period 1, period 2, period 3, etc.). The construction period was not considered for the assessment.

For each project, the information provided was reviewed in detail to identify the correct values for revenues and operational expenditure. Per the methodology's guidance, only those revenues and costs were considered that do not accrue uniformly through all scenarios identified in step 2 above.

All projects accrue revenues from the sale of electricity generated with the landfill gas collected. The way project proponents provide this information differs between projects. Some project proponents have provided figures for these revenues excluding value added tax, while the figures for other

projects include value added tax. Some projects receive subsidies in form of rebates for value added tax, for some projects additional surcharges apply in form of city construction taxes or “education fees” that depend on the amount of value added tax due by a project. All this information was harmonized by calculating for each project only the revenue from electricity sales after deducting payable value added tax and other surcharges.

The operational expenditure is provided more uniformly across different projects, making it not necessary to harmonize the data from the individual projects. For each project it was however validated that only those costs that do not apply to all scenarios were considered.

Finally, the costs and revenues were compared for each project in each period. The results of the assessment are shown in Table 1 below. Green shaded cells indicate that the revenues exceed the operational expenditures in the relevant period, while red shaded cells indicate the opposite.

Based on the outcome of the calculation above, projects are assigned to different groups of projects with similar patterns in the relationship between revenues and costs (see Table 2). For each group, an assessment is made whether the likely course of action for this group of projects is to continue or discontinue the collection and utilization of landfill gas.

For groups 1-3, consisting of 39 out of the 47 projects, there is a high likelihood that project owners will continue the mitigation activity without revenues from carbon credits. For these projects revenues exceed operational expenditure in all or most periods.

For groups 4-5, comprising 8 projects, the assessment remains inconclusive. For these projects, operational expenditure exceeds revenues during the last period of operation only (group 4) or after a certain period in time without revenues returning to exceeding OPEX afterwards (group 5).

Table 1 Difference between revenues other than CERs and OPEX for selected CDM landfill gas power projects

ID	Year	Country	Currency	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1240	2008	MX	USD	100,000	-0.4	4.4	4.3	4.2	4.2	7.6	7.5	7.4	7.3	7.2	7.1	10.5	10.4	10.3	10.2	10.1	9.9	9.8	9.7	9.6			
1258	2007	PH	EUR	100,000	-1.0	-1.0	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6													
1694	2006	CN	RMB	1,000,000	0.0	2.8	4.3	5.3	5.5	5.6	7.1	7.4	8.5	9.0	10.4	9.4	8.5	7.6	6.7	5.9	5.2	4.5	3.8	3.1	2.5	58.5	
1906	2007	CN	EUR	100,000	2.2	3.0	3.0	3.6	3.7	3.7	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	55.2								
1909	2007	CN	EUR	100,000	1.2	1.2	1.1	1.1	1.0	0.9	0.9	0.8	0.8	0.7	9.6												
2186	2008	MX	USD	100,000	6.3	11.8	11.0	10.3	9.7	9.1	8.5	8.0	7.5	7.0	6.6	6.2	5.8	5.5	5.1	4.8	4.5	4.3	4.0	3.8	3.6		
2451	2008	CN	RMB	1,000,000	0.7	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1										
2452	2008	CN	RMB	1,000,000	0.5	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1	0.1	0.0										
2810	2008	CN	RMB	1,000,000	1.4	1.0	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2								
2816	2007	CN	RMB	1,000,000	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2													
2892	2008	CN	RMB	1,000,000	1.3	1.3	1.1	1.0	0.9	0.7	0.6	0.5	0.4	0.3													
2944	2007	IN	INR	100,000	52.6	50.9	39.5	54.5	63.9	48.2	61.8	12.4	50.7	48.9	24.3	35.9	15.8	35.9	36.5								
3074	2009	MX	USD	100,000	0.8	3.3	3.4	3.6	3.7	3.9	4.0	4.2	4.4	4.5	4.7	4.9	5.1	5.1	4.6								
3260	2008	CN	RMB	1,000,000	0.0	0.9	1.5	1.8	1.8	1.8	3.1	3.6	4.0	4.4	4.5	4.5	4.5	4.5	4.4	3.6	1.8	1.8	1.8	1.4	1.1	0.8	0.2
3794	2008	CN	RMB	1,000,000	0.0	7.6	7.6	7.6	7.6	7.6	7.6	7.6	7.6	4.0	4.0	4.0											
3937	2007	CN	RMB	1,000,000	0.0	1.5	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.1	1.0	1.0	1.0	1.0	1.0	0.9							
4442	2009	CN	RMB	1,000,000	2.1	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6							
4610	2009	CN	RMB	1,000,000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.4	0.4	0.4	0.4	0.4	0.4	0.4	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1		
4743	2010	CN	RMB	1,000,000	-0.6	-0.2	-0.1	0.0	0.2	0.3	0.3	0.4	0.5	0.7	0.8	0.9	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.4		
5238	2009	CN	RMB	1,000,000	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.3	2.3	2.3	2.3	2.3	2.3	2.3								
5316	2009	CN	RMB	1,000,000	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6								
5326	2005	CN	RMB	1,000,000	0.0	1.9	1.9	4.6	4.6	7.4	7.4	7.4	7.4	7.4	7.4	1.4	7.4	1.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4		
5466	2009	CN	RMB	1,000,000	0.4	1.0	1.3	1.6	1.4	1.5	1.7	1.9	2.1	2.3	1.2												
5523	2009	CN	RMB	1,000,000	0.0	0.9	2.3	2.3	3.6	0.1	3.3	5.1	3.3	5.1	-0.2	4.6	6.3	4.6	6.3	-0.7	4.6	6.3	6.3	6.3	6.3		
5557	2011	CN	RMB	1,000,000	0.0	2.9	2.9	2.9	2.9	4.6	5.1	5.5	5.9	4.3	3.0	1.8	0.7	-0.1	-0.9	-1.6							
5657	2010	CN	RMB	1,000,000	0.0	-1.1	-0.7	-0.4	0.0	0.4	0.7	1.2	1.7	1.4	1.2	1.1											

ID	Year	Country	Currency	Unit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
5692a[1]	2012	ZA	ZAR	1,000,000	-1.9	2.3	3.0	2.4	3.6	2.8	4.1	3.1	0.0	3.1	1.7	1.8	1.3	-0.1	0.5	-0.8							
5692b	2012	ZA	ZAR	1,000,000	-1.9	2.5	2.5	1.7	4.5	5.5	6.5	7.5	5.0	7.3	11.1	2.7	16.5	16.9	17.9	19.0							
6000	2008	TH	BHT	1,000,000	0.5	0.5	0.4	0.4	0.2	0.3	0.3	0.2	0.2	-0.1													
6073	2010	CN	RMB	1,000,000	0.5	0.5	0.5	0.5	2.4	2.6	2.8	3.0	3.2	3.4	3.5	3.5	3.5	3.4	2.8	-0.4	-0.6	-1.2	-1.3	-1.5			
6229	2010	CN	RMB	1,000,000	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6								
6335	2008	MX	USD	100,000	0.0	0.0	-0.5	1.9	10.9	11.3	11.7	12.2	12.6	13.1	13.6	14.0	12.7	11.7									
6346	2011	CN	RMB	1,000,000	-0.2	-0.2	0.3	0.3	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7							
6701	2011	CN	RMB	1,000,000	1.0	1.2	1.0	1.0	0.8	0.6	0.5	0.4	0.2	0.2													
6704	2011	CN	RMB	1,000,000	-0.4	-0.2	0.0	0.3	0.5	0.6	0.9	1.1	1.1	1.4	1.6	1.7	1.9	1.6	2.2								
6732	2011	CN	RMB	1,000,000	0.0	0.3	0.6	1.0	1.3	1.5	1.9	2.2	2.4	2.2													
6771	2012	MX	USD	100,000	-1.0	-1.0	7.6	7.9	8.1	8.4	8.6	8.9	9.1	9.4	9.7	10.0	4.2	4.3	4.5	4.6	4.7	4.9	5.0	5.2	5.3		
6778	2012	MX	USD	100,000	-0.8	-0.8	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	4.0	4.1	4.2	4.3	4.5	4.6	4.7	4.9	5.0	5.2		
6922	2011	KR	KRW	100,000,000	3.8	3.4	1.9	2.9	3.4	1.2	3.3	2.9	1.8	2.6	2.4	0.1	2.5	1.9	1.7								
8118	2011	CN	RMB	1,000,000	4.7	4.7	4.7	5.7	5.7	5.7	6.9	6.9	6.9	4.8	4.8	3.7	3.7	2.5	2.5	-0.4	-0.4	-1.0	-1.0	-1.0	-3.6		
8152	2010	CN	RMB	1,000,000	0.0	0.5	0.4	0.9	1.4	1.8	2.2	2.5	2.3	2.1	1.9	1.7	1.5	1.3	1.1	1.0							
8603	2012	BR	EUR	100,000	0.0	9.4	10.3	11.1	11.8	12.4	13.0	13.3	13.3	13.3	13.3	12.5	10.6	9.2	8.3	7.5	7.0	6.6	6.2	5.9	5.7		
8962	2008	PA	USD	100,000	0.0	-1.0	-1.0	-1.0	-1.1	3.5	3.4	7.7	7.5	11.5	11.2	15.1	14.7	14.3	13.8	13.4	12.9	12.4	11.9	11.4	10.9		
9303	2011	GT	USD	100,000	18.1	21.8	21.8	13.8	21.8	21.8	21.8	13.8	21.8	21.8	21.8	13.8	21.8	21.8	3.6								
9346	2008	CN	RMB	1,000,000	0.0	0.8	1.3	1.6	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.9	1.7	1.5	1.3	1.2	1.0	0.9		
9413	2012	CN	RMB	1,000,000	-0.3	-0.3	5.0	4.9	4.9	12.3	12.1	17.3	17.3	17.3	17.3	17.3	12.1	12.1	4.7	4.7	4.7	4.7	4.7				
9686	2011	MX	USD	100,000	8.0	8.8	9.7	10.7	11.7	12.8	14.0	15.2	16.6	17.9	15.7	13.1	10.8	8.6	6.6	4.8	3.1	1.5	0.0	-1.4			

Source: Own calculation based on information provided by CDM projects.

[1] CDM project 5692 consists of two components at different locations for which separate financial analyses are provided. The suffixes 5692a and 5692b have been added in this table to depict the calculations for each component individually. The official CDM ID for both components is 5692.

Table 2 Assessment of vulnerability for data sample

Group	Project IDs	#	Description	Likely course of action
1	1694, 1906, 1909, 2186, 2451, 2810, 2816, 2892, 2944, 3074, 3260, 3794, 3937, 4442 5238, 5316, 5326, 5466, 6229, 6701, 6732, 6922, 8152, 8603, 9303, 9346	26	Revenues exceed OPEX during all periods of project operation. Continuing the activity is therefore the most likely scenario for these projects.	Continue the activity
2	1240, 1258, 4743, 5692b[2], 5657, 6335, 6346, 6771, 6778, 8962, 9413, 8962	12	Revenues exceed OPEX during all periods of project operation except the first periods of project operation. For some projects, sale of electricity form landfill gas utilization only starts in the second, third or fourth period, or it starts with very low levels of electricity generated. As for all following periods revenues exceed OPEX it is likely that the activity will be continued.	Continue the activity
3	5223 (Note: This also applies to project 5692a[2])	1	OPEX exceed revenues during one or two singular periods towards the middle of project operation. After each singular period, revenues return to exceeding OPEX, making it likely that the activity is continued.	Continue the activity
4	2452, 5692a[2], 6000, 9686	4	Revenues exceed OPEX during all periods of project operation except for the last period (except for 5692a[2]). This last period of the project's operation might be vulnerable to discontinuation as there might be no incentive to continue the activity in the last years of the project operation. However, discontinuing the activity might be associated with costs as well (e.g., for dismantling the equipment).	Inconclusive
5	4610, 5557, 6073, 8118	4	Revenues exceed OPEX except for several years at the end of the project operational period. This is however true under both the scenario with and without revenues from carbon credits (there are no CER sells planned in the	Inconclusive

[2] CDM project 5692 consists of two components at different locations for which separate financial analyses are provided. The suffixes 5692a and 5692b have been added in this table to depict the calculations for each component individually. The official CDM ID for both components is 5692.

			respective periods) which suggests that carbon credits do not have an influence for the continuation decision for these projects in the respective periods.	

Source: Own compilation.

Step 5: It is assumed that non-financial barriers would be an immaterial factor affecting whether these kinds of projects will continue or discontinue in the event of a market collapse.

Step 6: The most likely scenario for the project type is a continuation scenario, as for most of the assessed projects the revenues from the sales of electricity exceeds operational expenditures. Moreover, as identified in Step 2, there may be situations in which the projects would continue operation due to new or enforced legal requirements. The project type is therefore assigned a score of 1 under the CDM.