



Indicative simplified baseline and monitoring methodologies  
for selected small-scale CDM project activity categories

**TYPE III - OTHER PROJECT ACTIVITIES**

Follow the link to find [General guidance](#) / [Abbreviations](#)

***III.I. Avoidance of methane production in wastewater treatment through replacement of anaerobic lagoons by aerobic systems***

**Technology/measure**

1. This project category comprises measures that avoid the production of methane from biogenic organic matter in wastewaters being treated in anaerobic lagoons. Due to the project activity, the anaerobic lagoons<sup>1</sup> (deeper than 1 meter, with a residence time of more than one year and temperature above 15 deg C, without methane recovery), are substituted by aerobic systems. The project activity does not recover or combust methane in wastewater treatment facilities (unlike III H). Measures shall both reduce anthropogenic emissions by sources, and directly emit less than 15 kilo tonnes of carbon dioxide equivalent annually.

2. This category is applicable for project activities resulting in annual emission reductions lower than 25,000 ton CO<sub>2</sub>e. If the emission reduction of a project activity exceeds the reference value of 25,000 ton CO<sub>2</sub>e in any year of the crediting period, the annual emission reduction for that particular year is capped at 25,000 ton CO<sub>2</sub>e.

**Boundary**

3. The project boundary is the physical, geographical site where the wastewater treatment takes place.

**Project Activity Direct Emissions**

4. Total annual project activity related emissions shall be less than or equal to 15 kilo tonnes of CO<sub>2</sub> equivalent. Project activity emissions consists of

- (i) CO<sub>2</sub> emissions related to the power used by the project activity facilities. Emission factors for grid electricity or diesel fuel use shall be calculated as described in category I.D .
- (ii) Methane emissions from the decay of the sludge generated by the aerobic systems, if the sludge is left to decay anaerobically and disposed in a landfill without methane recovery.

$$PE_y = PE_{y,power} + PE_{y,sludge}$$

<sup>1</sup> Anaerobic lagoons are ponds deeper than 1 meter, without aeration, temperature above 15 deg C, and with a volumetric loading rate of Chemical Oxygen Demand above 0.1 kg COD/(m<sup>3</sup>.day).



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where:

PE<sub>y</sub>: project activity emissions in the year “y” (tonnes of CO<sub>2</sub> equivalent)  
 PE<sub>y,power</sub>: emissions through electricity consumption or diesel consumption in the year “y”  
 PE<sub>y,sludge</sub>: emissions through anaerobic decay of the sludge produced in the year “y”

$$PE_{y,sludge} = S_y * DOC_{s,y} * DOC_F * F * 16/12 * GWP_{CH_4}$$

where:

PE<sub>y,sludge</sub>: Methane emissions in the anaerobic decay of the sludge generated in the wastewater system in the year “y” (tonnes of CO<sub>2</sub> equivalent)  
 S<sub>y</sub>: Metered amount of sludge generated by the wastewater treatment in the year y (tonnes).  
 DOC<sub>s,y</sub>: Degradable organic content of the sludge generated by the wastewater treatment in the year y (mass fraction). It can be measured by sampling and analysis of the sludge produced, or the IPCC default value for solid wastes of 0.3 is used.  
 DOC<sub>F</sub>: Fraction of DOC dissimilated to biogas in the landfill (IPCC default value is 0.77).  
 F: Fraction of CH<sub>4</sub> in landfill gas (IPCC default is 0.5).  
 GWP<sub>CH<sub>4</sub></sub>: Global Warming Potential for CH<sub>4</sub> ( 21)

**Baseline**

5. The baseline scenario is the situation where, in the absence of the project activity, degradable organic matter in wastewater is treated in anaerobic lagoons and methane is emitted to the atmosphere. Baseline emissions are calculated as the amount of methane produced in the anaerobic system that was replaced with aerobic system.

6. The baseline emissions from the lagoon are estimated based on the chemical oxygen demand (COD) of the effluent that would enter the lagoon in the absence of the project activity, the maximum methane producing capacity (Bo) and a methane conversion factor (MCF) that expresses what proportion of the effluent would be anaerobically digested in the open lagoons. These CH<sub>4</sub> emissions from wastewater should be calculated according to the IPCC Guidelines as follows:

$$BE_y = COD_y * Bo * MCF * GWP_{CH_4}$$

where:

BE<sub>y</sub>: Baseline emissions in the year “y” (tonnes of CO<sub>2</sub> equivalent).  
 COD<sub>y</sub>: Chemical oxygen demand of effluent entering the lagoons in the year y (tonnes). It shall be directly measured, since the effluent that goes into the lagoon in the baseline situation is the same as the one that goes into the aerobic system in the project situation.  
 Bo: Maximum methane producing capacity. A value of 0.21 kg CH<sub>4</sub>/kg COD is used.  
 MCF: Methane conversion factor (fraction). The MCF default value to be adopted for projects in Africa, Asia and Latin America & Caribbean shall be 0.738, and for North America, Australia and New Zealand shall be 0.574.  
 GWP<sub>CH<sub>4</sub></sub>: Global Warming Potential for CH<sub>4</sub> (value of 21)

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**Leakage**

7. If the aerobic treatment technology is equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects at the site of the other activity are to be considered.

**Monitoring**

8. The emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - (PE_y + Leakage_y)$$

where:

$ER_y$  Emission reduction in the year “y” (tonnes of CO<sub>2</sub> eq.)

9. The amount of COD treated in the wastewater treatment plant shall be measured regularly. The wastewater flow shall be recorded. Through representative sampling and analysis, the COD content of the wastewater flowing to the treatment plant shall be recorded.

$$COD_y = Q_{WW,y} * COD_{m,y}$$

where:

$COD_y$  Chemical oxygen demand of effluent entering the wastewater treatment plant in the year “y” (tonnes).

$Q_{WW,y}$  Volume of wastewater treated by the plant in the year y (m<sup>3</sup>).

$COD_{m,y}$  Average chemical oxygen demand of the effluent entering the wastewater treatment plant in the year y (tonnes/m<sup>3</sup>).

10. The yearly amount of sludge produced ( $S_y$ ) shall be directly measured by weight or indirectly by its volume and density. Its degradable organic content ( $DOC_{s,y}$ ) will be measured by representative sampling and analysis, in case the default value is not used.