

III.H. Methane Recovery in Wastewater Treatment

Technology/measure

1. This project category comprises measures that recover methane from biogenic organic matter in wastewaters by means of one of the following options:

- (i) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with methane recovery and combustion;
- (ii) Introduction of anaerobic sludge treatment system with methane recovery and combustion to an existing wastewater treatment plant without sludge treatment;
- (iii) Introduction of methane recovery and combustion to an existing sludge treatment system;
- (iv) Introduction of methane recovery and combustion to an existing anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an on site industrial plant¹;
- (v) Introduction of anaerobic wastewater treatment with methane recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream;
- (vi) Introduction of a sequential stage of wastewater treatment with methane recovery and combustion, with or without sludge treatment, to an existing wastewater treatment system without methane recovery (e.g. introduction of treatment in an anaerobic reactor with methane recovery as a sequential treatment step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).

The recovered methane from the above measures may also be utilised for thermal or electrical energy generation (directly or after bottling of upgraded biogas) or for hydrogen production instead of combustion/flaring.

Remark:

calculation result

to be calculated

to be filled

Project emission (PE)

tCO₂e/year

$$PE_y = PE_{y,power} + PE_{y,ww,treated} + PE_{y,s,final} + PE_{y,fugitive} + PE_{y,dissolved} + PE_{y,bottling} \quad (1)$$

Where:

- PE_y Project activity emissions in the year “y” (tCO₂e)
- PE_{y,power} Emissions from electricity or diesel consumption in the year “y”
- PE_{y,ww,treated} Emissions from degradable organic carbon in treated wastewater in year “y”
- PE_{y,s,final} Emissions from anaerobic decay of the final sludge produced in the year “y”. If the sludge is controlled combusted, disposed in a landfill with methane recovery, or used for soil application, this term can be neglected, and the final disposal of the sludge shall be monitored during the crediting period
- PE_{y,fugitive} Emissions from methane release in capture and utilization/combustion/flare systems in year “y”
- PE_{y,dissolved} Emissions from dissolved methane in treated wastewater in year “y”. Project emissions from this source are only considered for project activities involving measures described in cases (i), (v) and (vi) of paragraph 1
- PE_{y,bottling} Emissions related to the production, upgrading and use of the bottled biogas in year “y”. (If the recovered methane is not upgraded for bottling this term can be neglected)

PE _{y,power}	<input type="text" value="0"/> tCO ₂ e/year	
	<input type="text" value="0"/> MWh/year	: Project electricity consumption
	<input type="text" value=""/> MWh/day	: Project electricity consumption
	<input type="text" value=""/> days/year	: Operation day of the project activity
	<input type="text" value=""/> tCO ₂ e/MWh	: CO ₂ emission factor per 1 MWh

PE_{y,ww,treated}0 tCO₂e/year

$$PE_{y,ww,treated} = Q_{y,ww} * COD_{y,ww,treated} * B_{o,ww} * MCF_{ww,final} * GWP_{CH_4}$$

Where:

Q_{y,ww} volume of wastewater treated in the year "y" (m³)COD_{y,ww,treated} chemical oxygen demand of the treated wastewater in the year "y" (tonnes/m³)¹B_{o,ww} methane producing capacity of the wastewater (IPCC default value for domestic wastewater of 0.21 kg CH₄/kg.COD)¹MCF_{ww,final} methane correction factor based on type of treatment and discharge pathway of the wastewater (fraction) (MCF Higher Value in table III.H.1 for sea, river and lake discharge i.e. 0.2).GWP_{CH₄} Global Warming Potential for methane (value of 21 is used)
 m³/year
 tonnes/m³
0.21 kg-CH₄/kg-COD21 tCO₂e/tCH₄PE_{y,s,final}0 tCO₂e/year

No methane emissions would occur from the decay of the final sludge, since it is assumed that sludge generated by the treatment system is to be controlled combusted, disposed in a landfill with methane recovery, or used for soil application for this project case.

PE_{y,fugitive}0 tCO₂e/year

$$PE_{y,fugitive} = PE_{y,fugitive,ww} + PE_{y,fugitive,s} \quad (4)$$

Where:

PE_{y,fugitive,ww} Fugitive emissions through capture and utilization/combustion/flare inefficiencies in the anaerobic wastewater treatment in the year "y" (tCO₂e)PE_{y,fugitive,s} Fugitive emissions through capture and utilization/combustion/flare inefficiencies in the anaerobic sludge treatment in the year "y" (tCO₂e)

$$PE_{y,fugitive,ww} = (1 - CFE_{ww}) * MEP_{y,ww,treatment} * GWP_{CH_4} \quad (5)$$

Where:

CFE_{ww} Capture and utilization/combustion/flare efficiency of the methane recovery and combustion/utilization equipment in the wastewater treatment (a default value of 0.9 shall be used, given no other appropriate value)MEP_{y,ww,treatment} Methane emission potential of wastewater treatment plant in the year "y" (tonnes)

$$MEP_{y,ww,treatment} = Q_{y,ww} * COD_{y,ww,treated} * B_{o,ww} * MCF_{ww,treatment} \quad (6)$$

Where:

MCF_{ww,treatment} Methane correction factor for the wastewater treatment system that will be equipped with methane recovery and combustion/flare/utilization equipment (MCF higher values in table III.H.1). 0 0 : See PE_{y,s,final} 0 tonnes/m³

PE_{y,dissolved}

0 tCO₂e/year

$$PE_{y,dissolved} = Q_{y,ww} * [CH_4]_{y,ww,treated} * GWP_{CH_4}$$

Where:

[CH₄]_{y,ww,treated} dissolved methane content in the treated wastewater (tonnes/m³). In aerobic wastewater treatment default value is zero, in anaerobic treatment it can be measured, or a default value of 10e-4 tonnes/m³ can be used².

0.0001 tonnes/m³

PE_{y,bottling}

0 tCO₂e/year

No emissions related to the production, upgrading and use of the bottled biogas for the project case does not involve these activities.

Baseline emission (BE)

0

tCO₂e/year

The baseline scenario will be one of the following situations:

- (i) The existing aerobic wastewater or sludge treatment system, in the case of substitution of one or both of these systems for anaerobic ones with methane recovery and combustion.
- (ii) The existing sludge disposal system, in the case of introduction of anaerobic sludge treatment system with methane recovery and combustion to an existing wastewater treatment plant.
- (iii) The existing sludge treatment system without methane recovery and combustion.
- (iv) The existing anaerobic wastewater treatment system without methane recovery and combustion.
- (v) The untreated wastewater being discharged into sea, river, lake, stagnant sewer or flowing sewer, in the case of introducing the anaerobic treatment to an untreated wastewater stream.
- (vi) The existing anaerobic wastewater treatment system without methane recovery for the case of introduction of a sequential anaerobic wastewater treatment system with methane recovery.

$$BE_y = Q_{y,ww} * COD_{y,ww,untreated} * B_{0,ww} * MCF_{ww,treatment} * GWP_{CH_4}$$

Where,

MCF_{ww,treatment} Methane correction factor for the existing wastewater treatment system to which the sequential anaerobic treatment step is being introduced (MCF lower value in Table III.H.1.)