Draft revision to the approved baseline and monitoring methodology AM0025

"Alternative waste treatment processes"

I. SOURCES, DEFINITIONS AND APPLICABILITY

Source

This baseline methodology is based on the following proposed methodologies:

- NM0090: "Organic waste composting at the Matuail landfill site Dhaka, Bangladesh" whose baseline study, monitoring and verification plan and project design document were prepared by World Wide Recycling B.V. and Waste Concern;
- NM0127: "PT Navigat Organic Energy Indonesia Integrated Solid Waste Management (GALFAD) project in Bali, Indonesia" whose baseline study, monitoring and verification plan and project design document were prepared by Mitsubishi Securities Co.;
- NM0032: "Municipal solid waste treatment cum energy generation project, Lucknow, India" whose baseline study, monitoring and verification plan were prepared by Infrastructure Development Finance Company Limited on behalf of Prototype Carbon Fund;
- NM0178: "Aerobic thermal treatment of municipal solid waste (MSW) without incineration in Parobé - RS" whose baseline study, monitoring and verification plan and project design document were prepared by ICF Consulting;
- NM0174-rev: "MSW Incineration Project in Guanzhuang, Tianjin City" whose baseline study, monitoring and verification plan and project design document were prepared by Global Climate Change Institute (GCCI) of Tsinghua University, Energy Systems International and Tianjin Taida Environmental Protection Co. Ltd.

This methodology also refers to the latest approved versions of the following tools:

- "Assessment of the validity of the current/original baseline and update of the baseline at the renewal of the crediting period";
- "Combined tool to identify the baseline scenario and demonstrate additionality";
- "Project emissions from flaring";
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";
- "Tool to calculate the emission factor for an electricity system";
- "Tool to determine the baseline efficiency of thermal or electric energy generation systems".
- Methodological tool "Emissions from solid waste disposal sites";
- Methodological tool "Project and leakage emissions from composting"; and
- Methodological tool "Project and leakage emissions from anaerobic digesters".

For more information regarding the proposed new methodologies and the tools as well as their consideration by the CDM Executive Board (the Board) please refer to <http://cdm.unfccc.int/methodologies/PAmethodologies/index.html>.

Selected approach from paragraph 48 of the CDM modalities and procedures

“Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment”

or

“Existing actual or historical emissions, as applicable”.

Definitions

For the purpose of this methodology the following definitions apply:

Anaerobic digester. Equipment that is used to generate biogas from liquid or solid waste through anaerobic digestion. The digester is covered or encapsulated to enable biogas capture for heat and/or electricity generation or feeding biogas into a natural gas network.

Anaerobic digestion. Degradation and stabilization of organic materials by the action of anaerobic bacteria that result in production of methane and carbon dioxide. Typical organic materials that undergo anaerobic digestion are municipal solid waste (MSW), animal manure, wastewater, organic industrial effluent and biosolids from aerobic wastewater treatment plants.

Anaerobic lagoon. A treatment system consisting of a deep earthen basin with sufficient volume to permit sedimentation of settable solids, to digest retained sludge, and to anaerobically reduce some of the soluble organic substrate. Anaerobic lagoons are not aerated, heated, or mixed anaerobic conditions prevail except for a shallow surface layer in which excess undigested grease and scum are concentrated.

Biogas. Gas generated from a digester. Typically, the composition of the gas is 50 to 70% CH_4 and 30 to 50% CO_2, with traces of H_2S and NH_3 (1 to 5%).

Co-composting. A type of composting where solid wastes and wastewater containing solid biodegradable organic material are composted together.

Composting. A process of biodegradation of waste under aerobic (oxygen-rich) conditions. Waste that can be composted must contain solid biodegradable organic material. Composting converts biodegradable organic carbon to mostly carbon dioxide (CO_2) and a residue (compost) that can be used as a fertilizer. Other outputs from composting can include, *inter alia*, methane (CH_4), nitrous oxide (N_2O), and run-off wastewater (in case of co-composting).

Digestate. Spent contents of an anaerobic digester. Digestate may be liquid, semi solid or solid. Digestate may be further stabilized aerobically (e.g. composted), applied to land, sent to a solid waste disposal site (SWDS), or kept in a storage or evaporation pond.

Industrial and hospital waste. Waste generated by industry or at a hospital. Waste generated by industry may be hazardous and from a hospital may be infectious (material-containing pathogens that can cause diseases), sharps (any items that can cause a cut), pathological (body tissues), pharmaceutical and radioactive (such as radioactive substances used for diagnosis and treatment of diseases). This type of waste is not suitable for being treated by some alternative waste treatment options.

Landfill gas (LFG). The gas generated by decomposition of waste in a SWDS. LFG is mainly composed of methane, carbon dioxide and small fractions of ammonia and hydrogen sulphide.

LFG capture system. A system to capture LFG. The system may be passive, active or a combination of both active and passive components. Passive systems capture LFG by means of natural pressure, concentration, and density gradients. Active systems use mechanical equipment to capture LFG by providing pressure gradients. For the purpose of this methodology, captured LFG can be flared or used.

Municipal solid waste (MSW). A heterogeneous mix of different solid waste types, usually collected by municipalities or other local authorities. MSW includes household waste, garden/park waste and commercial/institutional waste.

Organic waste. Waste that contains organic matter and may include domestic waste, commercial waste, industrial waste (such as sludge from wastewater treatment plants), hospital waste, and MSW. Waste by-products of treatment are excluded from the definition.

Refuse-Derived Fuel (RDF). Fuel derived from the mechanical and/or thermal treatment of waste to be used in an incineration or co-incineration process. RDF is produced by shredding and dehydrating solid waste with a waste converter technology.

Stabilized Biomass (SB). Fuel derived from the mechanical and/or thermal treatment of waste to be used in an incineration or co-incineration process. SB is mainly produced from agricultural waste and is treated to prevent further degradation in the environment. Examples of SB are: pellets, briquettes and torrified wood chips.

Solid waste. Material that is unwanted and insoluble (including gases or liquids in cans or containers).

Solid waste disposal site (SWDS). Designated areas intended as the final storage place for solid waste. Stockpiles are considered a SWDS if (a) their volume to surface area ratio is 1.5 or larger and if (b) a visual inspection by the DOE confirms that the material is exposed to anaerobic conditions (i.e. it has a low porosity and is moist).

Stockpile. A pile of solid waste (not buried below ground). Anaerobic conditions are not assured in a stockpile with low volume to surface area ratios (less than 1.5) because the waste may be exposed to higher aeration.

Syngas. A gas mixture consisting primarily of carbon monoxide and hydrogen and small amounts of carbon dioxide. It is produced from gasification and may be used as a fuel for energy generation or as or as an intermediate for the production of other chemicals.

Waste by-products. Waste by-products from the alternative waste treatment process. This does not include inert wastes that are removed during an initial sorting stage of the treatment process.

Fresh waste. Material that is unwanted and intended for disposal in a SWDS. This may comprise MSW and excludes old waste, waste by-products and hazardous waste.

Old waste. Waste that has been disposed of in a SWDS. Old waste has different characteristics than fresh waste, and would typically have low organic matter content, limiting its application to some alternative treatment options that require waste with a minimum level of organic material (e.g. composting and anaerobic digesters).

Run-off wastewater. Wastewater that is generated as a by-product of an alternative waste treatment option. This does not include fresh wastewater that is treated by the project activity that otherwise would have been disposed in an anaerobic lagoon.

Fresh wastewater. Wastewater containing organic material that is treated by the project activity that otherwise would have been disposed in the baseline anaerobic lagoon. Does not include run-off wastewater.

Scope and applicability

This methodology applies to project activities where fresh waste, originally intended for disposal in a SWDS, is treated using any (combination) of the alternative waste treatment options listed in Table 1. The project activity therefore avoids emissions of methane associated with disposing organic waste in a SWDS with or without a partial LFG capture system. In addition, the project activity may also potentially claim carbon emission reductions for:

- Avoiding methane emissions from degradation of wastewater in an anaerobic lagoon by treating the wastewater in combination with fresh waste by either co-composting or anaerobic digestion;
- Displacing natural gas in a natural gas distribution system with upgraded biogas;
- Displacing electricity in a grid or electricity generation by a fossil fuel fired cogeneration plant or captive plant with electricity generated within the project boundary; and
- Displacing heat generation by a fossil fuel fired cogeneration plant, boiler or air heater with heat that is generated with the project boundary, other than in a cement plant.

For activities that displace fossil fuel fired heat generation at a cement plant, with heat that is generated by the project activity using RDF/SB or syngas, then project participants may claim emission reductions for this activity by applying the relevant procedures from ACM0003 in combination with AM0025.

For activities that displace more carbon intensive feedstocks with the waste by-products of gasification, incineration or RDF/SB combustion (e.g. ash), then project participants may claim emission reductions for this activity by applying the relevant procedures from ACM0005 in combination with AM0025.

Table 1 provides the applicability conditions for each specific treatment option. In addition, the following general applicability conditions apply:

- Project activities consist of new constructed plant to implement the alternative waste treatment option;
- The alternative waste treatment option, except for composting, co-composting and anaerobic digestion, only processes wastes for which emission reductions are claimed (fresh waste or fresh wastewater). Anaerobic digestion may only process run-off wastewater in addition to fresh waste and fresh wastewater;
- Organic fresh waste prior to treatment and products and by-products of the alternative waste treatment option, are not stored on-site in a manner that results in anaerobic conditions. For example, stored in a stockpile that is considered a SWDS;
- Electricity or heat generated may be exported outside the project boundary;
- Run-off wastewater must be treated within the project bound ary;
- The compliance rate of regulations requiring the implementation of the alternative waste treatment option(s) used in the project activity during (part of) the crediting period is below 50%. For years in the crediting period that compliance is less than 50%, then carbon emission credits may be claimed;
- The project does not reduce the amount of waste that would be recycled in the absence of the project activity; and

- The baseline scenario is:
    - (a) The disposal of organic waste in a SWDS with or without a partial LFG capture system (M2 or M3);
    - (b) In the case of co-composting or the use of fresh wastewater in an anaerobic digester, then the treatment of organic wastewater in an existing or new to be built anaerobic lagoon without methane recovery (W1 or W4);
    - (c) In the case that the project activity generates electricity, then the electricity is obtained from an existing/new fossil fuel fired cogeneration plant, captive electricity plant or from the grid (P2, P4 or P6);
    - (d) In the case that the project activity generates heat and this displaces heat generation in the baseline, then the heat is generated from an existing/new fossil fuel fired cogeneration plant, boiler or air heater (H2 or H4).

Table 1: Alternative waste treatment options and applicability conditions

Treatment Option	Wastes that may be treated	Product and use	Waste by-products and management	Other treatment option specific applicability conditions
Composting or co-composing	• As per Compost Tool;[a] • Run-off wastewater	Compost - As per Compost Tool	• As per Compost Tool • Glass, aluminium, ferrous metals and plastics from waste sorting stages. • Run-off wastewater	As per Compost Tool
Anaerobic digestion	• As per AD Tool;[b] • Fresh wastewater; • Fresh waste; • Run-off wastewater	Biogas: • Within project boundary: flared, generates electricity or heat, and/or is upgraded and distributed in a natural gas distribution grid; • Outside project boundary: Biogas cannot be exported outside project boundary	• As per AD Tool • Glass, aluminium, ferrous metals and plastics from waste sorting stages	As per AD Tool
Thermal treatment	Fresh waste, excluding hospital and industrial waste	RDF/SB: • Within project boundary: generates electricity, heat or disposed of in a SWDS; • Outside project boundary: any use	• Waste by-products of RDF/SB combustion - composted or SWDS disposal; • Glass, aluminium and ferrous metals from waste sorting stages- any management	• Temperature limited to 300 degrees Celsius
Mechanical treatment	Fresh waste, excluding hospital and industrial waste	RDF/SB: • Within project boundary: generates electricity, heat or disposed of in a SWDS; • Outside project boundary: any use	• Run-off wastewater; • Waste-by products of RDF/SB combustion - composted or SWDS disposal; • Glass, aluminium and ferrous metals from	-

Treatment Option	Wastes that may be treated	Product and use	Waste by-products and management	Other treatment option specific applicability conditions
			waste sorting stages- any management	
Gasification	Fresh waste	• Electricity and/or heat (syngas is an intermediary product); • Syngas - any use including export outside the project boundary	• Waste by-products of gasification - any management; • Run-off wastewater; • Glass, aluminium and ferrous metals from waste sorting stages- any management	-
Incineration	Fresh waste	Electricity and/or heat	• Incineration by-product - any management; • Run-off wastewater; • Glass, aluminium and ferrous metals from waste sorting stages - any management	• Incineration technology is rotating fluidized bed, circulating fluidized bed, hearth or grate type; • Fraction of energy generated by auxiliary fossil fuel is no more than 50% of the total energy generated in the incinerator

[a] "Compost tool" refers to the methodological tool "Project and leakage emissions from composting".
[b] "AD tool" refers to the methodological tool "Project and leakage emissions from anaerobic digesters".

II. BASELINE METHODOLOGY PROCEDURE

Procedure for the selection of the most plausible baseline scenario and demonstration of additionality

Identify the baseline scenario and demonstrate additionality using the "Combined tool to identify the baseline scenario and demonstrate additionality" and following the requirements below.

In applying Step 1a of the tool:

- Baseline alternatives for the treatment of the organic waste shall take into consideration, *inter alia*, the following alternatives:

  M1: The project activity without being registered as a CDM project activity (i.e. any (combination) of the alternative waste treatment options listed in Table 1);

  M2: Disposal of the organic waste in a SWDS with a partial LFG capture system and captured LFG is flared;

M3: Disposal of the organic waste in a SWDS without a partial LFG capture system;

M4: Part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;

M5: Part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS;

M6: Part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS;

M7: Part of the organic fraction of the solid waste is gasified and not disposed in the SWDS;

M8: Part of the organic fraction of the solid waste is treated in an anaerobic digester and not disposed in the SWDS;

M9: Part of the organic fraction of the solid waste is mechanically or thermally treated to produce RDF/SB and not disposed in the SWDS.

- Baseline alternatives for the treatment of the organic wastewater shall take into consideration, *inter alia*, the following alternatives:

W1: Continuation of current practice of using anaerobic lagoons without methane recovery and flaring;

W2: Anaerobic lagoons with methane recovery and flaring;

W3: Anaerobic lagoons with methane recovery and utilization for electricity or heat generation;

W4: Building of a new anaerobic lagoon without methane recovery and flaring;

W5: Building of a new anaerobic lagoon with methane recovery and flaring;

W6: Using the organic wastewater for co-composting (the project activity implemented without CDM);

W7: Other treatment options provided in table 6.3, Volume 5, chapter 6 of the IPCC 2006 guidelines for greenhouse gas inventory.

- If electricity generation is an aspect of the project activity, then alternative scenarios for the generation of electricity shall also be identified. Alternative(s) shall include, *inter alia*:

P1: Electricity generated as an output of one of the alternative waste treatment options listed in Table 1 not undertaken as a CDM project activity;

P2: Existing or new construction of an on-site or off-site fossil fuel fired cogeneration plant;

P3: Existing or new construction of an on-site or off-site renewable based cogeneration plant;

P4: Existing or new construction of an on-site or off-site fossil fuel fired captive electricity plant;

P5: Existing or new construction of an on-site or off-site renewable based captive electricity plant;

P6: Existing and/or new grid-connected electricity plants.

- If heat generation is an aspect of the project activity, then alternative(s) shall include, *inter alia*:

H1: Heat generated from by-product of one of the options of waste treatment listed in Table 1, not undertaken as a CDM project activity;

H2: Existing or Construction of a new on-site or off-site fossil fuel fired cogeneration plant;[1]

H3: Existing or Construction of a new on-site or off-site renewable based cogeneration plant;[2]

H4: Existing or new construction of on-site or off-site fossil fuel based boilers or air heaters;

H5: Existing or new construction of on-site or off-site renewable energy based boilers or air heaters;

H6: Any other source such as district heat;

H7: Other heat generation technologies (e.g. heat pumps or solar energy).

- For the supply of upgraded biogas to a natural gas distribution network, the baseline is assumed to be the supply with natural gas.

In applying Sub-step 1b of the tool mandatory applicable legal and regulatory requirements may include mandatory LFG capture or destruction requirements because of safety issues or local environmental regulations.[3] Other policies could include local policies promoting productive use of LFG such as those for the production of renewable energy, or those that promote the processing of organic waste.

In applying Step 3 of the tool, then all costs and income shall be taken into account, including the income generated for the project participants from the products and by-products listed in Table 1. All technical and financial parameters have to be consistent across all baseline options;

Identification of the baseline fuel for heat generation

Project participants shall demonstrate that the identified baseline fuel used for generation of heat is available in abundance in the host country and there is no supply constraint. In case of partial supply constraints (seasonal supply), the project participants shall consider the period of partial supply among potential alternative fuel(s) the one that results in the lowest baseline emissions.

Detailed justifications shall be provided and documented in the CDM-PDD for the selected baseline fuel. As a conservative approach, the lowest carbon intensive fuel, such as natural gas, may be used throughout all period of the year.

Project boundary

The spatial extent of the project boundary is the SWDS where the waste is disposed of in the baseline, anaerobic lagoons treating organic wastewater in the baseline, and the site of the alternative waste treatment process(es). The boundary also includes on-site electricity and/or heat generation and use,

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[1] Scenarios P2 and H2 are related to the same fossil fuel cogeneration plant.

[2] Scenarios P3 and H3 are related to the same renewable energy based cogeneration plant.

[3] The project developer must bear in mind the relevant clarifications on the treatment of national and/or sectoral policies and regulations in determining a baseline scenario as per Annex 3 to the Executive Board 22nd meeting and any other forthcoming guidance from the Board on this subject.

on-site fuel use and the wastewater treatment plant used to treat the wastewater by-products of the alternative waste treatment process(es). The project boundary does not include facilities for waste collection and transport.

In the case that the project provides electricity to a grid, then the spatial extent of the project boundary will also include those plants connected to the energy system to which the plant is connected. If upgraded biogas is fed to a natural gas distribution system, then the natural gas distribution system is also included in the boundary.

Diagrams giving guidance for what is included in the project boundary are included in Appendix 1 for each alternative waste treatment option.

The GHG included in or excluded from the project boundary are listed in Table 2.

Table 2: Summary of gases and sources included in the project boundary, and justification/explanation where gases and sources are not included

	Source	**Gas**		**Justification / Explanation**
Baseline	Emissions from heat generation	CO_2	Included	Major emission source if heat generation is included in the project activity and displaces more carbon intensive heat generation in the baseline
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Emissions from decomposition of waste at the SWDS	CH_4	Included	The major source of emissions in the baseline
		N_2O	Excluded	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted for[a]
	Emissions from anaerobic lagoons	CO_2	Excluded	CO_2 emissions from biomass source are considered GHG neutral
		CH_4	Included	Methane emission from anaerobic process
		N_2O	Excluded	Not significant. Excluded for simplification and conservativeness
	Emissions from electricity consumption	CO_2	Included	Major source if electricity generation is included in the project activity and is sent to the grid or displaces fossil fuel fired electricity generation in the baseline
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from use of natural gas	CO_2	Excluded	Excluded for simplification. This is conservative
		CH_4	Included	Major emission source if supply of upgraded biogas through a natural gas distribution network is included in the project activity
		N_2O	Excluded	Excluded for simplification. This is conservative

Project Activity	Emissions from on-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Included	May be an important emission source. Includes heat generation for mechanical/thermal treatment process, start up of the gasifier, auxiliary fossil fuels needed to be added into incinerator, etc. It does not include transport
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Emissions from on-site electricity use	CO_2	Included	May be an important emission source. If electricity consumed was generated by the project activity, then emission of CO_2 from combusting fossil based waste are accounted for (e.g. from RDF/SB combustion or incineration)
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Emissions from the waste treatment processes	N_2O	Included	N_2O may be emitted from composting, incineration, Syngas produced and RDF/SB combustion
		CO_2	Included	CO_2 emissions from incineration, gasification or combustion of fossil based waste shall be included. CO_2 emissions from the decomposition or combustion of organic waste are not accounted[a]
		CH_4	Included	CH_4 leakage from the anaerobic digester and incomplete combustion in the flaring process are potential sources of project emissions. CH_4 may be emitted from incineration, gasification, composting and RDF/SB combustion
	Emissions from waste water treatment	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted[a]
		CH_4	Included	CH_4 emissions from anaerobic treatment of wastewater are accounted for. Aerobic treatment of wastewater shall not result in CH_4 emissions
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small

[a] *CO_2 emissions from the combustion or decomposition of* biomass *(see definition by the EB in Annex 8 of the EB's 20th meeting report) are not accounted as GHG emissions. Where the combustion or decomposition of biomass under a CDM project activity results in a decrease of carbon pools, such stock changes should be considered in the calculation of emission reductions. This is not the case for waste treatment projects.*

Baseline emissions

Baseline emissions are determined according to equation 1 and comprise the following sources:

A. Methane emissions from the SWDS in the absence of the project activity;

B. Methane emissions from the treatment of organic wastewater in the absence of the project activity;

C. Energy generated or electricity consumed by the grid in the absence of the project activity;

D. Natural gas used from the natural gas network in the absence of the project activity.

If there is a regulation that mandates the use of any (combination) of the alternative waste treatment options that is being implemented in the project, then the rate of compliance with this regulation in the host country shall be monitored ($RATE_{compliance,y}$). This rate is then used to adjust the baseline emissions calculation, according to **Equation 1**. For the case of more than one alternative waste treatment option being implemented in the project activity and regulation(s) do not apply evenly to these treatment options, then the rate of compliance shall be used to discount that part of the baseline emissions associated with the treatment option that the regulation applies to, according to **Equation 3**.

$$BE_y = \left(BE_{CH4,y} + BE_{WW,y} + BE_{EN,y} + BE_{NG,y}\right) \times DF_{RATE,y} \qquad \textbf{(1)}$$

With:

$$DF_{RATE,y} = \begin{cases} 1 - RATE_{compliance,y}, & \text{if } RATE_{compliance,y} < 0.5 \\ 0, & \text{if } RATE_{compliance,y} \geq 0.5 \end{cases} \qquad \textbf{(2)}$$

Where:

BE_y = Baseline emissions in year *y* (t CO_2e)
$BE_{CH4,y}$ = Baseline emissions of methane from the SWDS in year *y* (t CO_2e)
$BE_{WW,y}$ = Baseline emissions from the treatment of organic wastewater in year *y* (t CO_2e)
$BE_{EN,y}$ = Baseline emissions associated with energy generation in year *y* (t CO_2)
$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year *y* (t CO_2)
$RATE_{compliance,y}$ = Rate of compliance of a requirement that mandates the use of any (combination) of the alternative waste treatment options implemented in the project activity in year *y*
$DF_{RATE.,y}$ = Discount factor to account for $RATE_{Compliance,y}$

For the case that more than one alternative waste treatment option is being implemented in the project activity and regulation(s) do not apply equally to these treatment options, then calculate baseline emissions as follows. The allocation of baseline emissions to different alternative waste treatment options implemented in the project activity shall be described and justified in the CDM-PDD.

$$BE_y = \sum_t \left(BE_{CH4,t,y} + BE_{WW,y} + BE_{EN,t,y} + BE_{NG,t,y}\right) \times DF_{RATE,t,y} \qquad \textbf{(3)}$$

With:

$$DF_{RATE,t,y} = \begin{cases} 1 - RATE_{compliance,t,y}, & \text{if } RATE_{compliance,t,y} < 0.5 \\ 0, & \text{if } RATE_{compliance,t,y} \geq 0.5 \end{cases} \qquad \textbf{(4)}$$

Where:

BE_y = Baseline emissions in year *y* (t CO_2e)

$BE_{CH4,t,y}$ = Baseline emissions of methane from the SWDS in year *y* (t CO_2e)

$BE_{WW,y}$ = Baseline emissions from the treatment of organic wastewater in year *y* (t CO_2e)

$BE_{EN,y}$ = Baseline emissions associated with energy generation in year *y* (t CO_2)

$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year *y* (t CO_2)

$DF_{RATE.,y}$ = Discount factor to account for $RATE_{Compliance,t,y}$

$RATE_{compliance,t,y}$ = Rate of compliance of a requirement that mandates the use of alternative waste treatment option *t* in year *y*

t = Type of alternative waste treatment option

Procedure (A): Baseline emissions of methane from the SWDS ($BE_{CH4,y}$)

Baseline emissions of methane from the SWDS are determined using the methodological tool “Emissions from solid waste disposal sites”. The following requirements shall be taken into account when applying the tool:

(1) $W_{j,x}$ in the tool is the amount of organic waste prevented from disposal in the baseline SWDS due to its treatment in any (combination) alternative waste treatment option (e.g. it does not include waste by-products that are composted instead of being disposed to a SWDS in the project activity);

(2) Emissions are calculated using Application B in the tool, meaning that only waste avoided from the disposal after the start of the first crediting period shall be considered in the tool;

(3) Sampling to determine the fractions of different waste types is necessary (note that for the case that the waste is combusted in the project activity, then the parameter $Q_{j,c,y}$ in this methodology is equivalent to the variable $W_{j,x}$ in the tool);

(4) The tool instructs that f_y shall be determined based on historic data or contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available). The following additional instruction applies:

  (i) If the requirement specifies a percentage of the LFG that is required to be flared, the amount shall equal $f_{y.}$;

  (ii) If the requirement does not specify the amount or percentage of LFG that should be destroyed but requires the installation of a capture system, without requiring the captured LFG to be flared then $f_y = 0$; and

  (iii) If the requirement does not specify any amount or percentage of LFG that should be destroyed but requires the installation of a system to capture and flare the LFG, then it is assumed $f_y = 0.2$:[4]

[Comments are sought on the inclusion of a baseline campaign to calculate emissions from the SWDS. Procedure similar to that included in AM0093 would be used.]

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[4] Project participants may propose and justify an alternative default value as a request for revision to this methodology.

Procedure (B): Baseline emissions from organic wastewater

Step 1: Calculation of baseline emissions from anaerobic treatment of the fresh wastewater

The baseline methane emissions from anaerobic treatment of the fresh wastewater in open lagoons are estimated based on the chemical oxygen demand (COD) of the fresh wastewater that would enter the lagoon in the absence of the project activity ($COD_{BL,y}$), the maximum methane producing capacity (B_o) and a methane conversion factor ($MCF_{BL,y}$) which expresses the proportion of the fresh wastewater that would decay to methane, as follows:

$$BE_{CH4,MCF,y} = GWP_{CH4} \times MCF_{BL,y} \times B_o \times COD_{BL,y} \tag{5}$$

Where:

$BE_{CH4,MCF,y}$ = Baseline methane emissions using the Methane Conversion Factor (tCO_2e/y)

GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4)

B_o = Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand ($tCH_4/tCOD$)

$MCF_{BL,y}$ = Average baseline methane conversion factor (fraction) in year *y*, representing the fraction of ($COD_{BL,y}$ x B_o) that would be degraded to CH_4 in the absence of the project activity

$COD_{BL,y}$ = Quantity of chemical oxygen demand that would be treated in open lagoons in the absence of the project activity in year *y* (tCOD/yr)

<u>*Determination of $COD_{BL,y}$*</u>

In principle, the baseline chemical oxygen demand ($COD_{BL,y}$) corresponds to the chemical oxygen demand that is treated under the project activity ($COD_{PJ,y}$). But, if there would be effluent from the lagoons in the baseline, COD_{BL} should be adjusted by an adjustment factor which relates the COD supplied to the lagoon with the COD in the effluent.

$$COD_{BL,y} = \rho\left(1 - \frac{COD_{out,x}}{COD_{in,x}}\right) \times COD_{PJ,y} \tag{6}$$

Where:

$COD_{BL,y}$ = Quantity of chemical oxygen demand that would be treated in open lagoons in the absence of the project activity in year *y* (t COD/yr)

$COD_{PJ,y}$ = Quantity of chemical oxygen demand that is treated in the anaerobic digester or by co-composting in the project activity in year *y* (t COD/yr)

$COD_{out,x}$ = COD of the effluent in the period *x* (t COD)

$COD_{in,x}$ = COD directed to the open lagoons in the period *x* (t COD)

x = Representative historical reference period

ρ = Discount factor for historical information

$COD_{PJ,y}$ is determined as follows:

$$COD_{PJ,y} = \sum_{m=1}^{12} F_{PJ,dig,m} \times COD_{dig,m} \tag{7}$$

Where:

$COD_{PJ,y}$ = Quantity of chemical oxygen demand that is treated in the anaerobic digester or by co-composting in the project activity in year *y* (t COD/yr)

$F_{PJ,dig,m}$ = Quantity of fresh wastewater that is treated in the anaerobic digester or under clearly anaerobic conditions in the project activity in month *m* (m³/month)

$COD_{dig,m}$ = Chemical oxygen demand in the fresh wastewater that is treated in the anaerobic digester or under clearly anaerobic conditions in the project activity in month *m* (t COD / m³)

m = Months of year *y* of the crediting period

Determination of $MCF_{BL,y}$

The quantity of methane generated from COD disposed to the open lagoon depends mainly on the temperature and the depth of the lagoon. Accordingly, the methane conversion factor is calculated based on a factor f_d, expressing the influence of the depth of the lagoon on methane generation, and a factor $f_{T,y}$ expressing the influence of the temperature on the methane generation. In addition, a conservativeness factor of 0.89 is applied to account for the uncertainty associated with this approach. $MCF_{BL,y}$ is calculated as follows:

$$MCF_{BL,y} = f_d \times f_{T,y} \times 0.89 \qquad \textbf{(8)}$$

Where:

$MCF_{BL,y}$ = Average baseline methane conversion factor (fraction) in year *y*, representing the fraction of ($COD_{BL,y}$ x B_o) that would be degraded to CH_4 in the absence of the project activity

f_d = Factor expressing the influence of the depth of the lagoon on methane generation

$f_{T,y}$ = Factor expressing the influence of the temperature on the methane generation in year *y*

0.89 = Conservativeness factor

Determination of fd

f_d represents the influence of the average depth of the lagoon on methane generation.

$$f_d = \begin{cases} 0\,; & if\ D < 1m \\ 0.5; & if\ 1\,m \le D < 2\,m \\ 0.7; & if\ D \ge 2\,m \end{cases} \qquad (9)$$

Where

f_d = Factor expressing the influence of the depth of the lagoon on methane generation

D = Average depth of the lagoons (m)

Determination of $f_{T,y}$

An increase in temperature in the lagoon has several benefits to generate more methane, including an increasing solubility of the organic compounds, enhanced biological and chemical reaction rates. The factor $f_{T,y}$ is calculated with the help of a monthly stock change model which aims at assessing how much COD degrades in each month.

For each month *m*, the quantity of fresh wastewater directed to the lagoon, the quantity of organic compounds that decay and the quantity of any effluent water from the lagoon is balanced, giving the quantity of COD that is available for degradation in the next month: The amount of organic matter available for degradation to methane ($COD_{available,m}$) is assumed to be equal to the amount of organic matter directed to the open lagoon, less any effluent, plus the COD that may have remained in the lagoon from previous months, as follows:

$$\mathrm{COD_{available,m}} = \mathrm{COD_{BL,m}} + (1 - \mathrm{f_{T,m}}) \times \mathrm{COD_{available,m\text{-}1}} \text{ with} \quad \textbf{(10)}$$

$$\mathrm{COD_{BL,m}} = \left(1 - \frac{COD_{out,x}}{COD_{in,x}}\right) \times \mathrm{COD_{PJ,m}} \text{ and} \quad \textbf{(11)}$$

$$\mathrm{COD_{PJ,m}} = \mathrm{F_{PJ,dig,m}} \times \mathrm{COD_{dig,m}} \quad \textbf{(12)}$$

Where:

$\mathrm{COD_{available,m}}$ = Quantity of chemical oxygen demand available for degradation in the open lagoon in month *m* (t COD/month)

$\mathrm{COD_{BL,m}}$ = Quantity of chemical oxygen demand that would be treated in open lagoons in the absence of the project activity in month *m* (t COD/month)

$\mathrm{COD_{PJ,m}}$ = Quantity of chemical oxygen demand that is treated in the anaerobic digester or by co-composting in the project activity in month *m* (t COD/month)

$\mathrm{F_{PJ,dig,m}}$ = Quantity of fresh wastewater that is treated in the anaerobic digester or under clearly anaerobic conditions in the project activity in month *m* (m^3/month)

$\mathrm{COD_{dig,m}}$ = Chemical oxygen demand in the fresh wastewater that is treated in the anaerobic digester or by co-composting in the project activity in month *m* (t COD/m^3)

$\mathrm{f_{T,m}}$ = Factor expressing the influence of the temperature on the methane generation in month *m-1*

m = Months of year *y* of the crediting period

$\mathrm{COD_{out,x}}$ = COD of the effluent in the period *x* (t COD)

$\mathrm{COD_{in,x}}$ = COD directed to the open lagoons in the period *x* (t COD)

x = Representative historical reference period

In case of emptying the lagoon, the accumulation of organic matter restarts with the next inflow and the COD available from the previous month should be set to zero. The monthly factor to account for the influence of the temperature on methane generation is calculated based on the following “van’t Hoff – Arrhenius” approach:

$$\mathrm{f_{T,m}} = \begin{cases} 0 & \text{if} \quad T_{2,m} < 283K \\ \mathrm{e}^{\left(\frac{\mathrm{E*(T_{2,m} - T_1)}}{\mathrm{R*T_1*T_{2,m}}}\right)} & \text{if} \quad 283K \le T_{2,m} \le 303K \\ 1 & \text{if} \quad T_{2,m} > 303K \end{cases} \quad \textbf{(13)}$$

Where:

$\mathrm{f_{T,m}}$ = Factor expressing the influence of the temperature on the methane generation in month *m*

E = Activation energy constant (15,175 cal/mol)

$\mathrm{T_{2,m}}$ = Average temperature at the project site in month *m* (K)

$\mathrm{T_1}$ = 303.16 K (273.16 K + 30 K)

R = Ideal gas constant (1.987 cal/K mol)

m = Months of year *y* of the crediting period

The annual value $f_{T,y}$ is calculated as follows:

$$f_{T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{avaialble,m}}{\sum_{m=1}^{12} COD_{BL,m}} \tag{14}$$

Where:

$f_{T,y}$ = Factor expressing the influence of the temperature on the methane generation in year *y*

$f_{T,m}$ = Factor expressing the influence of the temperature on the methane generation in month *m*

$COD_{available,m}$ = Quantity of chemical oxygen demand available for degradation in the open lagoon in month *m* (t COD/month)

$COD_{BL,m}$ = Quantity of chemical oxygen demand that would be treated in open lagoons in the absence of the project activity in month *m* (t COD/month)

m = Months of year *y* of the crediting period

Procedure (C): Baseline emissions from generation of energy

This procedure is distinguished depending on if the baseline is the separate generation of electricity and heat or the combined generation of heat and electricity by cogeneration.

Procedure (C.1): Separate generation of electricity and heat.

$$BE_{EN,y} = BE_{EC,y} + BE_{HG,y} \tag{15}$$

Where:

$BE_{EN.,y}$ = Baseline emissions associated with energy generation in year *y* (t CO_2)

$BE_{EC,y}$ = Baseline emissions associated with electricity generation in year *y* (t CO_2e)

$BE_{HG,y}$ = Baseline emissions associated with heat generation in year *y* (t CO_2e)

Procedure (C.1.1): Baseline emissions from separate generation of electricity ($BE_{EC,y}$)

The baseline emissions associated with electricity generation in year *y* ($BE_{EC,y}$) shall be calculated using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”. When applying the tool:

- The electricity sources *k* in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and
- $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated by the alternative waste treatment option *t* and exported to the grid or displacing fossil fuel fired captive energy plant in year *y* ($EG_{t,y}$).

Procedure (C.1.2): Baseline emissions associated with separate generation of heat ($BE_{HG,y}$)

If the facility where heat generated by the project activity is used is a cement plant, then project participants may not account for baseline emissions using AM0025, however may instead apply AM0025 in combination with ACM0003 to potentially claim emission reduction credits for this use. For use of heat in other facilities where the baseline heat generation was a fossil fuel fired boiler or air heater, use the procedure below.

The baseline emissions associated with heat generation in year *y* ($BE_{HG,y}$) are determined based on the heat generation in the project activity, as follows:

$$BE_{HG,y} = \frac{HG_{PJ,y} \times EF_{CO2,BL,HG}}{NCV_{fuel} \times \eta_{HG,BL}} \qquad \textbf{(16)}$$

Where:

$BE_{HG,y}$ = Baseline emissions associated with heat generation in year *y* (t CO_2 / yr)
NCV_{fuel} = Net calorific value of the fossil fuel type used for heat generation by the boiler or air heater in the baseline (TJ / volume or mass)
$\eta_{HG,BL}$ = Efficiency of the boiler or air heater used for heat generation in the baseline
$HG_{PJ,y}$ = Quantity of heat supplied by the project activity displacing baseline heat generation by a fossil fuel boiler or air heater in year *y* (TJ)
$EF_{CO2,BL,HG}$ = CO_2 emission factor of the fossil fuel type used for heat generation by the boiler or air heater in the baseline (t CO_2 / volume or mass)

To estimate the baseline energy efficiency of the boiler or air heater in the baseline ($\eta_{HG,BL}$) project participants shall apply the “Tool to determine the baseline efficiency of thermal or electric energy generation systems”.

Procedure (C.2): Cogeneration of electricity and heat

Baseline emissions from electricity and heat cogeneration are calculated by multiplying electricity generation ($EG_{t,y}$) and heat supplied ($HG_{PJ,y}$) with the CO_2 emission factor of the fuel used by the cogeneration plant, as follows:

$$BE_{EN,y} = \frac{(EG_{t,y} \times 3.6) \times 10^{-3} + HG_{PJ,y}}{\eta_{cogen}} \times EF_{CO2,BL,CGc} \qquad \textbf{(17)}$$

Where:

$BE_{EN.,y}$ = Baseline emissions associated with energy generation in year *y* (t CO_2)
$EF_{CO2,BL,CG}$ = CO_2 emission factor of the fossil fuel type used for energy generation by the cogeneration plant in the baseline (t CO_2 / TJ)
$HG_{PJ,y}$ = Quantity of heat supplied by the project activity displacing baseline heat generation by a fossil fuel cogeneration plant in year *y* (TJ)
$EG_{t,y}$ = Electricity generated by the alternative waste treatment option *t* and exported to the grid or displacing fossil fuel fired cogeneration in year *y* (MWh)
η_{Cogen} = Efficiency of cogeneration plant that would have been used in the absence of the project activity (ratio)

Efficiency of the cogeneration plant (η_{Cogen}) shall be one of the following:

(1) Highest of the measured efficiencies of similar plants;

(2) Highest of the efficiency values provided by two or more manufacturers for similar plants; or

(3) Maximum efficiency of 90%, based on net calorific values.

Procedure (D): Baseline emissions associated with natural gas use ($BE_{NG,y}$)

$BE_{NG,y}$ is estimated as follows:

$$BE_{NG,y} = BIOGAS_{NG,y} \times NCV_{BIOGAS,NG,y} \times EF_{CO2,NG,y} \tag{18}$$

Where:

$BE_{NG,y}$ = Baseline emissions associated with natural gas use in year *y* (t CO_2e)
$BIOGAS_{NG,y}$ = Quantity upgraded biogas sent to the natural gas network due to the project activity in year *y* (Nm^3)
$NCV_{BIOGAS,NG,y}$ = Net Calorific Value of upgraded biogas sent to the natural gas network due to the project activity in year *y* (TJ / Nm^3)
$EF_{CO2,NG,y}$ = Average CO_2 emission factor of natural gas in the natural gas network in year *y* (t CO_2e / TJ)

$EF_{CO2,NG,y}$ is determined using the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”.

Project emissions

The project emissions in year *y* are calculated for each alternative waste treatment option implemented in the project activity as follows:

$$PE_y = PE_{COMP,y} + PE_{AD,y} + PE_{GAS,y} + PE_{RDF\_SB,y} + PE_{INC,y} \tag{19}$$

Where:

PE_y = Project emissions in the year *y* (t CO_2e)
$PE_{COMP,y}$ = Project emissions from composting or co-composting in year *y* (t CO_2e)
$PE_{digester,y}$ = Project emissions from anaerobic digester and biogas combustion in year *y* (t CO_2e)
$PE_{GAS,y}$ = Project emissions from gasification in year *y* (t CO_2e)
$PE_{RDF\_SB,y}$ = Project emissions associated with RDF/SB in year *y* (t CO_2e)
$PE_{INC,y}$ = Project emissions from incineration in year *y* (t CO_2e)

Project emissions from composting or co-composting ($PE_{COMP,y}$)

Project emissions associated with composting or co-composting ($PE_{COMP,y}$) are calculated according to the methodological tool to estimate “Project and leakage emissions from composting”.

Project emissions from anaerobic digestion ($PE_{AD,y}$)

$PE_{AD,y}$ is calculated according to the methodological tool to estimate “Project and leakage emissions from anaerobic digesters”. When estimating parameters $PE_{EC.y}$ and $PE_{FC.y}$ in the tool, then sources of electricity and fossil fuel consumption shall include processing, upgrading and compressing the biogas into the natural gas network (if this is part of the project activity).

Project emissions from gasification ($PE_{GAS,y}$)

Project emissions from gasification include carbon dioxide emissions as well as small amounts of methane and nitrous oxide from combustion ($PE_{COM,GAS,y}$) and shall also account for electricity consumption, fossil fuel consumption and wastewater treatment (if associated with the gasification treatment process). Emissions associated with the combustion of syngas are not accounted for. Project emissions are therefore determined as follows:

$$PE_{GAS,y} = PE_{COM,GAS,y} + PE_{EC,GAS,y} + PE_{FC,GAS,y} + PE_{ww,GAS,y} \tag{20}$$

Where:

$PE_{GAS,y}$ = Project emissions from gasification in year *y* (t CO_2e)
$PE_{COM,GAS,y}$ = Project emissions from combustion associated with gasification in year *y* (t CO_2)
$PE_{EC,GAS,y}$ = Project emissions from electricity consumption associated with gasification in year *y* (t CO_2e)
$PE_{FC,GAS,y}$ = Project emissions from fossil fuel consumption associated with gasification in year *y* (t CO_2e)
$PE_{ww,GAS.y}$ = Project emissions from the wastewater treatment associated with gasification in year *y* (t CH_4)

$PE_{EC,GAS,y}$ is determined according to the procedure *Project emissions from electricity use*, where $PE_{EC,GAS,y}$= $PE_{EC,t,y}$ and the alternative waste treatment option *t* is gasification.

$PE_{FC,GAS,y}$ is determined according to the procedure *Project emissions from fossil fuel use*, where $PE_{FC,GAS,y}$= $PE_{FC,t,y}$ and the alternative waste treatment option *t* is gasification.

$PE_{ww,GAS.y}$ is determined according to the procedure *Project emissions from wastewater treatment*, where $PE_{ww,GAS.y}$ = $PE_{ww,t,y}$ and the alternative waste treatment option *t* is gasification.

$PE_{COM,,GAS.y}$ is determined according to the procedure *Project emissions from combustion within the project boundary*, where $PE_{COM,GAS,y}$= $PE_{COM,c,y}$ and the combustor *c* is the gasifier.

Project emissions associated with mechanical or thermal production of RDF/SB ($PE_{RDF\_SB,y}$)

Project emissions associated with RDF/SB comprise both the emissions from the mechanical/thermal production process (e.g. electricity, fossil fuel consumption and wastewater treatment, if relevant) as well as the combustion of RDF/SB (if this is part of the project activity). If the RDF/SB is disposed of in a SWDS, then this is accounted for as leakage emissions according to the procedure *Leakage emissions associated with RDF/SB*. Project emissions are determined as follows:

$$PE_{RDF\_SB,y} = PE_{COM,\boldsymbol{RDF\_SB},y} + PE_{EC,RDF\_SB,y} + PE_{FC,RDF\_SB,y} + PE_{ww,RDF\_SB,y} \tag{21}$$

Where:

$PE_{RDF\_SB,y}$ = Project emissions associated with RDF/SB in year *y* (t CO_2e)
$PE_{COM,RDF\_SB,y}$ = Project emissions from combustion of fossil waste associated with combustion of RDF/SB within the project boundary in year *y* (t CO_2)
$PE_{EC,RDF\_SB,y}$ = Project emissions from electricity consumption associated with RDF/SB (production and on-site combustion) in year *y* (t CO_2e)
$PE_{FC,RDF\_SB,y}$ = Project emissions from fossil fuel consumption associated with RDF/SB (production and on-site combustion) in year *y* (t CO_2e)
$PE_{ww,RDF\_SB,y}$ = Project emissions from the wastewater treatment associated with RDF/SB (production and on-site combustion) in year *y* (t CH_4)

$PE_{EC,RDF\_SB,y}$ is determined according to the procedure *Project emissions from electricity use*, where $PE_{EC,RDF\_SB,y}$= $PE_{EC,t,y}$ and the alternative waste treatment option *t* is production of RDF/SB.

$PE_{FC,RDF\_SB,y}$ is determined according to the procedure *Project emissions from fossil fuel use*, where $PE_{FC,RDF\_SB,y}$= $PE_{FC,t,y}$ and the alternative waste treatment option *t* is production of RDF/SB.

$PE_{ww,RDF\_SB,y}$ is determined according to the procedure *Project emissions from wastewater treatment*, where $PE_{ww,RDF\_SB,y}$ = $PE_{ww,t,y}$ and the alternative waste treatment option *t* is production of RDF/SB.

$PE_{COM,,RDF\_SB,y}$ is determined according to the procedure *Project emissions from combustion within the project boundary*, where $PE_{RDF\_SB,COM,y}$= $PE_{COM,t,y}$ and the combustor *c* is the RDF/SB combustor.

Project emissions from incineration ($PE_{INC,y}$)

Project emissions from incineration include emissions from combustion within the project boundary ($PE_{COM,INC,y}$). If associated with the incineration process, then project emissions shall also account for electricity consumption, fossil fuel consumption and wastewater treatment. Project emissions are therefore determined as follows:

$$PE_{INC,y} = PE_{COM,INC,y} + PE_{EC,INC,y} + PE_{FC,INC,y} + PE_{ww,INC,y} \quad \textbf{(22)}$$

Where:

$PE_{INC,y}$	=	Project emissions from incineration in year y (t CO_2e)
$PE_{COM,INC,y}$	=	Project emissions from combustion within the project boundary of fossil waste associated with incineration in year *y* (t CO_2)
$PE_{EC,INC,y}$	=	Project emissions from electricity consumption associated with incineration year *y* (t CO_2e)
$PE_{FC,INC,y}$	=	Project emissions from fossil fuel consumption associated with incineration in year *y* (t CO_2e)
$PE_{ww,INC,y}$	=	Project emissions from the wastewater treatment associated with incineration in year *y* (t CH_4)

$PE_{EC,INC,y}$ is determined according to the procedure *Project emissions from electricity use*, where $PE_{EC,INC,y} = PE_{EC,t,y}$ and the alternative waste treatment option *t* is incineration.

$PE_{FC,INC,y}$ is determined according to the procedure *Project emissions from fossil fuel use*, where $PE_{FC,INC,y} = PE_{FC,t,y}$ and the alternative waste treatment option *t* is incineration.

$PE_{ww,INC,y}$ is determined according to the procedure *Project emissions from wastewater treatment*, where $PE_{ww,INC,y} = PE_{ww,t,y}$ and the alternative waste treatment option *t* is incineration.

$PE_{COM,INC,y}$ is determined according to the procedure *Project emissions from combustion within the project boundary*, where $PE_{INC,COM,y} = PE_{COM,t,y}$ and the combustor *c* is the incinerator.

Project emissions from electricity use ($PE_{EC,t,y}$)

The project emissions from electricity consumption due to an alternative waste treatment process *t* ($PE_{EC,t,y}$) shall be calculated using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”. When applying the tool:

(1) Project emissions shall be calculated for the sources of electricity consumed due to the alternative waste treatment process, excluding consumption of electricity that was generated by the project activity ($EC_{t,y}$);

(2) If the project activity consists of more than one alternative waste treatment process, then project participants may choose to monitor electricity consumption for the entire site and then allocate this consumption to one of the different alternative waste treatment processes (e.g apportionment based on sub-metering data not required).

Project emissions from fossil fuel use ($PE_{,FC,t,y}$)

The project emissions from fossil fuel combustion associated with an alternative waste treatment process ($PE_{FC,t,y}$) shall be calculated using the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”. When applying the tool:

(1) Processes *j* in the tool correspond to the sources of fossil fuel consumption due to the alternative waste treatment process, other than for electricity generation. Consumption sources shall include, as relevant, for starting the gasifier, auxiliary fossil fuels for operating

the incinerator, heat generation for mechanical/thermal treatment process and on-site fossil fuel combustion during co-firing with waste. Fossil fuels used as part of the on-site processing or management of feedstocks and by-products shall also be included.

(2) If the project activity consists of more than one alternative waste treatment process, then project participants may choose to monitor fossil fuel consumption for the entire site and then allocate consumption to one of the different alternative waste treatment processes.

Project emissions from combustion ($PE_{COM,c,y}$)

This procedure estimates emissions emitted from gasifiers, incinerators or RDF/SB combustors ($PE_{COM,c,y}$) (not flares, syngas combustors or biogas combustors). Emission consist of carbon dioxide, and additionally for the case of gasifiers and incinerators, small amounts of methane and nitrous oxide, as follows:

$$PE_{COM,c,y} = PE_{COM\_CO2,c,y} + PE_{COM\_CH4,NO2,c,y} \quad \textbf{(23)}$$

Where:

$PE_{COM,c,y}$ = Project emissions from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2e)

$PE_{COM\_CO2,c,y}$ = Project emissions of CO_2 from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2)

$PE_{COM\_CH4,N2O,c,y}$ = Project emissions of CH_4 and N_2O from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2)

c = Combustor used in the project activity: gasifier, incinerator or RDF/SB combustor

Project emissions of CO_2 from combustion within the project boundary ($PE_{COM\_CO2,c,y}$)

Carbon dioxide project emissions associated with on-site combustion ($PE_{COM\_CO2,c,y}$) are calculated based on the fossil carbon content of the fresh waste or RDF/SB combusted, not biogenic carbon content.[5] The procedure requires monitoring the following:

- Total carbon content of the fresh waste fed into the combustor *c* (either gasifier, incinerator or RDF/SB combustor);
- Fraction of fossil carbon content of the fresh waste or RDF/SB; and
- Combustion efficiency.

Project participants may select from either of two options to calculate $PE_{COM\_CO2,c,y}$. Option 1 requires sorting the fresh waste into components of waste type *j* and then determining the fossil-based carbon content of each waste type *j*. Option 2 is based on determining the fossil-based carbon content of the unsorted fresh waste or RDF/SB (noting that Option 1, sorting into waste fractions, is not applicable if only RDF/SB is combusted).

Option 1: Waste sorted into waste type fractions

$$PE_{COM\_CO2,c,y} = EF_{COM,c,y} \times \frac{44}{12} \times \sum_j Q_{j,c,y} \times FCC_{j,y} \times FFC_{j,y} \quad \textbf{(24)}$$

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[5] CO_2 emissions from the combustion or decomposition of *biomass* (see definition by the EB in Annex 8 of the EB's 20th meeting report) are not accounted as GHG emissions. Where the combustion or decomposition of biomass under a CDM project activity results in a decrease of carbon pools, such stock changes should be considered in the calculation of emission reductions. This is not the case for waste treatment projects.

Where:

$PE_{COM\_CO2,c,y}$ = Project emissions of CO_2 from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2)
$Q_{j,c,y}$ = Quantity of fresh waste type *j* fed into combustor *c* the in year *y* (t)
$FCC_{j,y}$ = Fraction of total carbon content in waste type *j* in year *y* (t C / t)
$FFC_{j,y}$ = Fraction of fossil carbon in total carbon content of waste type *j* in year *y* (weight fraction)
$EF_{COM,c,y}$ = Combustion efficiency of combustor *c* in year *y* (fraction)
44/12 = Conversion factor (t CO_2 / t C)
c = Combustor used in the project activity: gasifier, incinerator or RDF/SB combustor
j = Waste type

Project participants may select to either directly monitor the amount of waste type *j* fed into the combustor *c* in year *y* ($Q_{j,c,y}$) or calculate this parameter based on monitoring the total waste fed to the combustor and sampling the waste to determine the fraction of waste type *j* as per the following equation:

$$Q_{j,c,y} = Q_{waste,c,y} \times \frac{\sum_{n=1}^{z} p_{n,j,y}}{z} \qquad \textbf{(25)}$$

Where:

$Q_{j,c,y}$ = Quantity of waste type *j* fed into combustor *c* the in year *y* (t)
$Q_{waste,c,y}$ = Quantity of fresh waste fed into combustor *c* the in year *y* (t)
$p_{n,j,y}$ = Fraction of waste type *j* in the sample *n* collected during the year y (weight fraction)
z = Number of samples collected during the year *y*
n = Samples collected in year *y*
j = Waste type

Option 2: Based on unsorted waste

$$PE_{COM\_CO2,c,y} = \frac{44}{12} \times EF_{COM,c,y} \times Q_{waste,c,y} \times FFC_{wsate,c,y} \qquad \textbf{(26)}$$

Where:

$PE_{COM\_CO2,c,y}$ = Project emissions of CO_2 from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2)
$Q_{waste,c,y}$ = Quantity of fresh waste or RDF/SB fed into combustor *c* the in year *y* (t)
$FFC_{waste,c,y}$ = Fraction of fossil-based carbon in waste or RDF/SB fed into combustor *c* the in year *y* (t C / t)
$EF_{COM,c,y}$ = Combustion efficiency of combustor *c* in year *y* (fraction)
44/12 = Conversion factor (t CO_2 / t C)
c = Combustor used in the project activity: gasifier, incinerator or RDF/SB combustor
j = Waste type, including RDF/SB

Project emissions of CH_4 and N_2O from combustion within the project boundary ($PE_{COM\_CH4,N2O,c,y}$)

Emissions of N_2O and CH_4 from combustion of RDF/SB are neglected because they are considered very minor. For the case of gasification or incineration, then project participants may choose either Option 1 or Option 2 to estimate emissions of N_2O and CH_4 from combustion within the project boundary. Option 1 calculates emission based on monitoring N_2O and CH_4 content in the stack gas. Option 2 calculates emissions using default emission factors for the amount of N_2O and CH_4 emitted per tonne of fresh waste combusted.

Option 1: Monitoring N_2O and CH_4 content in stack gas

$$PE_{COM\_CH4,N2O,c,y} = SG_{c,y} \times \left(C_{N2O,SG,c,y} \times GWP_{N2O} + \times C_{CH4,SG,c,y} \times GWP_{CH4}\right) \quad \textbf{(27)}$$

Where:

$PE_{COM\_CH4,N2O,c,y}$ = Project emissions of CH_4 and N_2O from combustion within the project boundary of fossil carbon in combustor *c* in year *y* (t CO_2)

$SG_{c,y}$ = Volume of stack gas from combustor *c* in year *y* (m^3)

$C_{N2O,SG,c,y}$ = Concentration of nitrous oxide in the stack gas from combustor *c* in year *y* (t N_2O / m^3)

GWP_{N2O} = Global Warming Potential of nitrous oxide (t CO_2e / t N_2O)

$C_{CH4,SG,c,y}$ = Concentration of methane in the stack gas from combustor *c* in year *y* (t CH_4 / m^3)

GWP_{CH4} = Global Warming Potential of methane (t CO_2e / t CH_4)

c = Combustor used in the project activity: gasifier, incinerator

Option 2: Using default emission factors

$$PE_{COM\_CH4,N2O,c,y} = Q_{waste,c,y} \times \left(EF_{N2O,SG} \times GWP_{N2O} + EF_{CH4,SG} \times GWP_{CH4}\right) \quad \textbf{(28)}$$

Where:

$PE_{COM\_CH4,N2O,c,y}$ = Project emissions of CH_4 and N_2O from combustion within the project boundary associated with combustor *c* in year *y* (t CO_2)

$Q_{waste,c,y}$ = Quantity of fresh waste fed into combustor *c* in year *y* (t)

$EF_{N2O,SG}$ = Emission factor for N_2O in the stack gas from combustion (t N_2O / t waste)

$EF_{CH4,SG}$ = Emission factor for CH_4 in the stack gas from combustion (t CH_4 / t waste)

GWP_{N2O} = Global Warming Potential of nitrous oxide (t CO_2e / t N_2O)

GWP_{CH4} = Global Warming Potential of methane (t CO_2e / t CH_4)

c = Combustor used in the project activity: gasifier, incinerator

Emissions from run-off wastewater management ($PE_{ww,t,y}$)

If the run-off wastewater generated by the project activity is treated using an aerobic treatment process, such as by co-composting, then project emissions from wastewater treatment are assumed to be zero. If the run-off wastewater is treated in the anaerobic digester, then emissions are calculated according to the procedure *Project emissions from anaerobic digestion.*

If the project activity generates run-off wastewater that is treated anaerobically (other than in an anaerobic digester that is part of the project activity), stored anaerobically or released untreated, then project participants shall determine $PE_{ww,t,y}$, with the following equation. The calculation is distinguished for the situation that there is either complete, partial or no flaring/combustion of the methane generated by the run-off wastewater treatment process:

$$PE_{ww,t,y} = \begin{cases} \mathrm{Q}_{\mathrm{ww,y}} \times \mathrm{P}_{\mathrm{COD,y}} \times \mathrm{B}_0 \times \mathrm{MCF}_{\mathrm{ww}} \times \mathrm{GWP}_{\mathrm{CH4}}, \text{for no flaring} \\ \mathrm{Q}_{\mathrm{ww,y}} \times \mathrm{P}_{\mathrm{COD,y}} \times \mathrm{B}_0 \times \mathrm{MCF}_{\mathrm{ww}} \times \mathrm{GWP}_{\mathrm{CH4}} + (\frac{PE_{Flare,ww,y}}{GWP_{CH4}} - F_{CH4,flare,y}), \text{for partial flaring} \\ \frac{PE_{Flare,ww,y}}{GWP_{CH4}}, \text{for complete flaring} \end{cases} \quad \mathbf{(29)}$$

Where:

$PE_{ww,t,y}$ = Project emissions of methane from run-off wastewater associated with alternative waste treatment option *t* in year *y* ($t\ CO_2e$)

$Q_{ww,y}$ = Amount of run-off wastewater treated anaerobically or released untreated in year *y* (m^3)

$P_{COD,y}$ = COD of the run-off wastewater in year *y* ($t\ COD / m^3$)

B_o = Maximum methane producing capacity of the COD applied ($t\ CH_4 / t\ COD$)

MCF_{ww} = Methane conversion factor (fraction)

GWP_{CH4} = Global warming potential of CH_4 ($t\ CO_2e / t\ CH_4$)

$PE_{flare,ww,y}$ = Emissions from flaring associated with run-off wastewater treatment in year *y* ($t\ CO_2e$)

$F_{CH4,flare,y}$ = Amount of methane in the run-off wastewater treatment emissions which is sent to the flare/combustor in year *y* ($t\ CH_4$)

The methodological tool "Project emissions from flaring" shall be used to estimate the resulting methane emissions from flaring ($PE_{flare,ww,y}$ is estimated as parameter $PE_{flare,y}$ in the tool). If the methane is combusted in an incinerator, rather than flared, then for the case that project participants have selected Option 1 to use monitored data to determine *Project emissions of CH_4 and N_2O from combustion within the project boundary* then these emissions are already accounted for. If Option 2 to use default values was selected instead, then assume a 90% destruction efficiency of the methane contained in the gas, with $PE_{flare,ww,y}$=$PE_{com,ww,y}$ and emissions calculated as follows:

$$PE_{com,ww,y} = F_{CH4,flare,y} \times 0.1 \quad \mathbf{(30)}$$

Where:

$PE_{com,ww,y}$ = Emissions from combustion of methane generated from wastewater treatment in year *y* ($t\ CO_2e$)

$F_{CH4,flare,y}$ = Amount of methane in the wastewater treatment gas that is sent to the flare/combustor in year *y* ($t\ CH_4/yr$)

$F_{CH4,flare,y}$ is determined using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream", applying these requirements:

- The gaseous stream the tool shall be applied to is the wastewater treatment emissions delivery pipeline to the flare(s);
- CH_4 is the greenhouse gases for which the mass flow shall be determined;
- The flow of the gaseous stream shall be measured on continuous basis,
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the tool); and
- The mass flow shall be calculated for an hourly time interval *t* and then summed for the year *y* ($t\ CH_4$).

If the wastewater treated is sourced from more than one alternative waste treatment option implemented on-site, then the emissions may be estimated for the entire site and then allocated to any of the treatment options.

Leakage

Leakage emissions are associated with composting/co-composting, anaerobic digestion and the use of RDF/SB that is exported outside the project boundary. For the case that waste by-products of the alternative waste treatment option are composted or co-composted, then these shall be treated as fresh waste with emissions estimated according to the procedure *Project emissions from composting* *($PE_{COMP,y}$)*.

Leakage emissions are determined as follows:

$$LE_y = LE_{COMP,y} + LE_{AD,y} + LE_{RDF\_SB,y} \quad \textbf{(31)}$$

Where:
LE_y = Leakage emissions in the year *y* (t CO_2e)
$LE_{COMP,y}$ = Leakage emissions from composting or co-composting in year *y* (t CO_2e)
$LE_{AD,y}$ = Leakage emissions from anaerobic digester in year *y* (t CO_2e)
$LE_{RDF\_SB,y}$ = Leakage emissions associated with RDF/SB in year *y* (t CO_2e)

Leakage emissions from composting ($LE_{COMP,y}$)

Leakage emissions associated with composting ($LE_{COMP,y}$) are calculated according to the methodological tool to estimate "Project and leakage emissions from composting".

Leakage emissions from anaerobic digestion ($LE_{AD,y}$)

Leakage emissions associated with anaerobic digestion of waste ($LE_{AD,y}$) are calculated according to the methodological tool to estimate "Project and leakage emissions from anaerobic digesters".

Leakage emissions associated with RDF/SB ($LE_{RDFSB,y}$)

Leakage emissions associated with RDF/SB are accounted for the organic waste by-products of the treatment process (not by-products from the RDF/SB combustor), which may be composted or disposed of in a SWDS, and the end-use of RDF/SB that is exported off-site, as follows:

$$LE_{RDFSB,y} = LE_{ENDUSE,RDFSB,y} + L_{SWDS,WBP\_RDFSB,y} \quad \textbf{(32)}$$

Where:
$LE_{RDFSB,y}$ = Leakage emissions associated with RDF/SB in year *y* (t CO_2e)
$LE_{SWDS,\ WBP\_RDFSB,y}$ = Leakage emissions associated with disposing of waste by-products associated with RDF/SB production in a SWDS in year *y* (t CO_2e)
$LE_{OFFSITE,RDFSB,y}$ = Leakage emissions associated with the end-use of RDF/SB exported outside the project boundary in year *y* (t CO_2e)

Leakage emissions from disposal of waste by-products from RDF/SB production in a SWDS

$LE_{SWDS,WBP\_RDFSB,y}$ is determined using the methodological tool "Emissions from solid waste disposal sites". In the tool, *x* begins with the start of the CDM project activity and extends to the end of year *y* (e.g. emissions are calculated using Application B in the tool and waste disposed from the start of the first crediting period shall be considered).

$W_{j,x}$ in the tool is the amount of organic waste contained in the waste by-products from the production of RDF/SB in year *y* (e.g. it does not include waste by-products that are composted instead of being disposed to a SWDS in the project activity or waste by-products from the combustion of RDF/SB).

Leakage emissions associated with end use of RDF/SB exported outside the project boundary ($LE_{ENDUSE,RDFSB,y}$)

The potential leakage emissions associated with the use of the RDF/SB that is exported outside the project boundary are that it may be combusted or decompose anaerobically. Emissions are therefore calculated allowing for the situation that RDF/SB exported in year *y* may have three different end uses *u,* as follows:

- End use 1: Documented evidence is provided that the RDF/SB exported off-site is used as raw material in fertilizer, ceramic manufacture or as a fuel that is combusted in a CDM project activity: No leakage emissions;
- End use 2: Documented evidence is provided that the RDF/SB exported off-site is combusted or used as a raw material in furniture: RDF/SB is considered to be combusted - $LE_{ENDUSE,RDFSB,y}$ shall be calculated, according to procedure below;
- End use 3: No documented evidence is provided that the off-site end use of RDF/SB is either combustion, furniture manufacture, fertilizer or ceramic production: RDF/SB may degrade anaerobically or be combusted – so conservatively it is assumed that the RDF/SB degrades anaerobically according to the procedure below.

Leakage emissions from off-site anaerobic decomposition of RDF/SB

Emissions from anaerobic decomposition of RDF/SB are accounted for by adjusting the quantity of organic waste that produced RDF/SB that was used in Procedure (A) for the calculation of baseline emissions, as follows:

In Procedure (A) for calculating baseline emissions using the methodological tool “Emissions from solid waste disposal sites”, adjust the amount of organic waste that was treated to produce the RDF/SB in year *y* ($W_{RDFSB,j,x}$) to account for the situation that not all this organic waste avoided disposal of in a SWDS. The adjusted parameter $W_{RDFSB,j,x,adj}$ shall be determined by multiplying the ratio of RDF/SB exported off-site that is assumed to degrade anaerobically and the amount of RDF/SB produced in year *y* as follows:

$$W_{RDFSB,j,x,adj} = \frac{Q_{export,RDF\_SB,y}}{Q_{RDF\_SB,y}} \times W_{RDFSB,j,x} \qquad \textbf{(33)}$$

Where:

$W_{RDFSB,j,x,adj}$	=	Amount of solid waste type *j* prevented from disposal in the SWDS by treatment to produce RDF/SB in the year *x* adjusted by the proportion of RDF/SB that is disposed of in a SWDS (t)
$W_{RDFSB,j,x}$	=	Amount of solid waste type *j* prevented from disposal in the SWDS by treatment to produce RDF/SB in the year *x* (t)
$Q_{export,RDF\_SB,y}$	=	Amount of RDF/SB exported offsite with potential to degrade anaerobically in year *y* (t)
$Q_{RDFSB,y}$	=	Amount of RDF/SB produced by the project activity in year *y* (t)

Leakage emissions from combusted off-site end use of RDF/SB ($LE_{ENDUSE,RDFSB,y}$)

This procedure estimates emissions associated with combustion of RDF/SB outside the project boundary, where the combustor is outside the control of the project participants. Carbon dioxide emissions ($LE_{COM\_,RDFSB,y}$) are calculated as follows

$$LE_{OFFSITE,RDFSB,y} = Q_{RDFSB\_COM,y} \times NCV_{RDFSB,y} \times EF_{CO2,RDFSB,y} \quad \textbf{(34)}$$

Where:

$LE_{ENDUSE,RDFSB,y}$ = Leakage emissions of CO_2 from off-site combustion of RDF/SB in year *y* (t CO_2)
$Q_{RDFSB\_COM,,y}$ = Quantity of RDF/SB exported off-site with potential to be combusted in year *y* (t)
$EF_{CO2,RDFSB,y}$ = CO_2 emissions factor for RDF/SB in year *y* (t CO_2 / GJ)
$NCV_{RDFSB,y}$ = Net calorific value of the alternative or less carbon intensive fossil fuel type *k* in year *y* (GJ / t)

Emission Reductions

To calculate the emission reductions the project participant shall apply the following equation:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(35)}$$

Where:

ER_y = Emissions reductions in year *y* (t CO_2e)
BE_y = Baseline emissions in year *y* (t CO_2e)
PE_y = Project emissions in the year *y* (t CO_2e)
LE_y = Leakage emissions in year *y* (t CO_2e)

If the sum of PE_y and LE_y is smaller than 1% of BE_y in the first full operation year of a crediting period, the project participants may choose to assume a fixed percentage of 1% for PE_y and LE_y combined for the remaining years of the crediting period.

In the case that overall negative emission reductions arise in a year, ERs are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. (For example: if negative emission reductions of 30 t CO_2e occur in the year t and positive emission reductions of 100 t CO_2e occur in the year t+1, 0 CERs are issued for year t and only 70 CERs are issued for the year t+1.)

Changes required for methodology implementation in 2nd and 3rd crediting periods

The required changes shall be assessed using the tool for “Assessment of the validity of the current/original baseline and update of the baseline at the renewal of the crediting period”.

Project activity under a programme of activities

In addition to the requirements set out in the latest approved version of the “Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities”, the following shall be applied for the use of this methodology in a project activity under a programme of activities (PoAs).

The PoA may consist of one or several types of CPAs. CPAs are regarded to be of the same type if they are similar with regard to the demonstration of additionality, emission reduction calculations and monitoring. The CME shall describe in the CDM-PoA-DD for each type of CPAs separately:

(a) Eligibility criteria for CPA inclusion used for each type of CPAs. In case of combinations of treatment options in one CPA, the eligibility criteria shall be defined for each treatment option, separately;

(b) Emission reduction calculations for each type of CPAs;

(c) Monitoring provisions for each type of CPAs.

The CME shall describe transparently and justify in the CDM-PoA-DD which CPAs are regarded to be of the same type. CPAs shall not be regarded to be of the same type if one of the following conditions is different:

(a) The baseline scenario with regard to any of the following aspects:
    (i) The disposal of organic waste in a SWDS without a LFG capture system;
    (ii) The disposal of organic waste in a SWDS with a partical LFG capture system;
    (iii) In case of co-composting, the treatment of organic wastewater in:
        - Existing anaerobic lagoon;
        - New to be built anaerobic lagoon;

(b) The project activity with regard to a treatment option used as well as any of the following aspects of the treatment option:
    (i) Composting:
        - Closed composting;
        - Open composting (wind rows);
    (ii) Co-composting;
        - Closed composting;
        - Open composting (wind rows);
    (iii) Thermal treatment:
        - Generation of electricity;
        - Generation of heat;
        - Combination of heat and electricity generation;
        - Any other use;
    (iv) Mechanical treatment:
        - Generation of electricity;
        - Generation of heat;
        - Combination of heat and electricity generation;
        - Any other use;
    (v) Gasification:
        - Generation of electricity;
        - Generation of heat;
        - Combination of heat and electricity generation;

        - Any other use;
    - (vi) Incineration:
        - Generation of electricity;
        - Generation of heat;
        - Combination of heat and electricity generation;
        - Any other use.
    - (vii) Combination of any treatment options or use of the product/by-product (e.g., heat or electricity from biogas) for within a treatment option listed above;
- (c) The legal and regulatory framework.

When defining eligibility criteria for CPA inclusion for a distinct type of CPAs, the CME shall consider relevant technical and economic parameters, such as:

- (a) Type of solid waste disposal site:
    - (i) New solid waste disposal site;
    - (ii) Existing solid waste disposal site;
- (b) Ranges of capacity of the treatment plant or unit;
- (c) Composition of the waste (e.g., mixed or single type of waste);
- (d) Ranges of costs (capital investment, operating and maintenance costs, etc.);
- (e) Ranges of revenues (income from electricity, heat or biogas sale, subsidies/fiscal incentives, ODA).

The eligibility criteria related to the costs and revenues parameters shall be updated every 2 years in order to correctly reflect the technical and market circumstances of a CPA implementation

In case the PoA contains several types of CPAs, the actual CPA-DD submitted for the purpose of registration of the PoA shall contain all information required as per the latest approved version of the “Guidelines for completing the component project activity design document form” for each type of actual CPA, to be validated by a DOE and submitted for the registration to the Board.

Data and parameters not monitored

Data / Parameter:	FFC_j
Data unit:	%
Description:	Fraction of fossil carbon in total carbon content of waste type *j*
Source of data:	Tables 2.4, chapter 2, volume 5 of IPCC 2006 guidelines
Value to be applied:	For MSW the following values for the different waste types *j* may be applied:
Any comment:	-

Table 3: Default values for $FFC_{j,y}$

Waste type *j*	**Default**
Paper/cardboard	5
Textiles	50
Food waste	-
Wood	-
Garden and Park waste	0
Nappies	10
Rubber and Leather	20
Plastics	100
Metal*	NA
Glass*	NA
Other, inert waste	100

*Metal and glass contain some carbon of fossil origin. Combustion of significant amounts of glass or metal is not common.

If a waste type is not comparable to a type listed in Table 3, or can not clearly be described as a combination of types in this table above, or if the project participants wish to measure $FFC_{j,}$, then project participants shall measure $FFC_{j,y}$ using the following standards, or similar national or international standards*:*

- ASTM D6866: "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis";
- ASTM D7459: "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil Carbon Dioxide Emitted from Stationary Emissions Sources"

The frequency of measurement shall be as a minimum four times in year *y* with the mean value valid for year *y*

Data / Parameter:	GWP_{CH4}
Data unit:	$t\ CO_2e\ /\ t\ CH_4$
Description:	Global Warming Potential of CH_4
Source of data:	IPCC
Value to be applied:	21 for the first commitment period. Shall be updated for future commitment periods according to any future COP/MOP decisions
Any comment:	-

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Data / Parameter:	GWP_{N2O}
Data unit:	t CO_2e / t N_2O
Description:	Global Warming Potential of N_2O
Source of data:	IPCC
Value to be applied:	310 for the first commitment period. Shall be updated for future commitment periods according to any future COP/MOP decisions
Any comment:	-

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Data / Parameter:	MCF_{ww}
Data unit:	Fraction
Description:	Methane conversion factor
Source of data:	The source of data shall be the following, in order of preference: 1. project specific data; 2. country specific data; or 3. IPCC default values (table 6.3, chapter 6, volume 4 of IPCC 2006 guidelines)
Measurement procedures (if any):	-
Any comment:	As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain

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<table>
<tr><th>Data / Parameter:</th><th>$EF_{CH4,SG}$</th></tr>
<tr><td>Data unit:</td><td>t CH_4 / t waste</td></tr>
<tr><td>Description:</td><td>Emission factor for CH_4 in the stack gas from combustion</td></tr>
<tr><td>Source of data:</td><td>Table 5.3, chapter 5, volume 5 of IPCC 2006 guidelines</td></tr>
<tr><td>Measurement procedures (if any):</td><td>If country-specific data is available, then this shall be applied and the method used to derive the value as well as the data sources need to be documented in the CDM-PDD. If country-specific data are not available, then apply the default values listed in Table 4. For continuous incineration of industrial waste, apply the CH4 emission factors provided in Volume 2, Chapter 2, Stationary Combustion of IPCC 2006 Guidelines.
Table 4: CH_4 emission factors for combustion
<table>
<tr><th>Waste type</th><th colspan="2">Type of incineration/technology</th><th>CH_4 Emission Factors ($t\ CH_4$ / t waste) wet basis</th></tr>
<tr><td rowspan="6">MSW</td><td rowspan="2">Continuous incineration</td><td>stoker</td><td>1.21x 0.2x10^{-6}</td></tr>
<tr><td>fluidised bed</td><td>~0</td></tr>
<tr><td rowspan="2">Semi-continuous incineration</td><td>stoker</td><td>1.21x 6x10^{-6}</td></tr>
<tr><td>fluidised bed</td><td>1.21x 188x10^{-6}</td></tr>
<tr><td rowspan="2">Batch type incineration</td><td>stoker</td><td>1.21x 60x10^{-6}</td></tr>
<tr><td>fluidised bed</td><td>1.21x 237x10^{-6}</td></tr>
<tr><td colspan="3">Industrial sludge (semi-continuous or batch type incineration)</td><td>1.21x 9 700x10^{-6}</td></tr>
<tr><td colspan="3">Waste oil (semi-continuous or batch type incineration)</td><td>1.21x 560x10^{-6}</td></tr>
</table>
A conservativeness factor of 1.21 has been applied to account for the uncertainty of the IPCC default values</td></tr>
<tr><td>Any comment:</td><td>Applicable to Option 2 of procedure to estimate $PE_{COM,c,y}$</td></tr>
</table>

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Data / Parameter:	$EF_{N2O,SG}$
Data unit:	t N_2O / t waste (wet basis)
Description:	Emission factor for N_2O in the stack gas from combustion
Source of data:	Table 5.6, chapter 5, volume 5 of IPCC 2006 guidelines
Measurement procedures (if any):	If country-specific data is available, then this shall be applied and the method used to derive the value as well as the data sources need to be documented in the CDM-PDD. If country-specific data are not available, then apply the default values listed in Table 5. **Table 5: N_2O emission factors for combustion** (see table below) A conservativeness factor of 1.21 has been applied to account for the uncertainty of the IPCC default values.
Any comment:	Applicable to Option 2, of procedure to estimate $PE_{COM,c,y}$

Table 5: N_2O emission factors for combustion

Type of waste	**Technology / Management practice**	**Emission factor (t N2O / t waste wet basis)**
MSW	continuous and semi-continuous incinerators	$1.21x\ 50x10^{-3}$
MSW	batch-type incinerators	$1.21x\ 60x10^{-3}$
Industrial waste	all types of incineration	$1.21x\ 100x10^{-3}$
Sludge (except sewage sludge)	all types of incineration	$1.21x\ 450x10^{-3}$
Sewage sludge	incineration	$1.21x\ 900x10^{-3}$

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Data / Parameter:	NCV_{fuel}
Data unit:	TJ / volume or mass unit
Description:	Net calorific value of the fossil fuel type used for heat generation by the boiler or air heater in the baseline
Source of data:	Project participants
Measurement procedures (if any):	Fuel type is identified through the baseline identification procedure for the heat generating equipment used to generate the thermal energy in the absence of the project activity
Any comment:	Applicable to baseline emissions procedure (C). Volume or mass unit should match the unit for $EF_{CO2,BL,HG}$

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Data / Parameter:	$EF_{CO2,BL,HG}$
Data unit:	t CO_2 / volume or mass unit
Description:	CO_2 emission factor of the fossil fuel type used for heat generation by the boiler or air heater in the baseline
Source of data:	The source of data shall be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	-
Any comment:	-

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Data / Parameter:	$EF_{CO2,BL,CG}$
Data unit:	t CO_2 / MJ
Description:	Emission factor of baseline fossil fuel used in the cogeneration plant, as identified in the baseline scenario identification
Source of data:	The source of data shall be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	-
Any comment:	-

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Data / Parameter:	$COD_{out,x}$ $COD_{in,x}$
Data unit:	t COD
Description:	COD of the effluent in the period x COD directed to the open lagoons
Source of data:	For existing plants: (a) If there is no effluent: $COD_{out,x} = 0$; (b) If there is effluent: • One year of historical data should be used , or • If one year data is not available then x represents a measurement campaign of at least 10 days to the COD inflow (CODin,x) and COD outflow (CODout,x) from the lagoon For Greenfield projects: (a) Use the design COD inflow for COD in and the design effluent COD flow for COD out corresponding to the design features of the lagoon system identified in the procedure for the selection of the baseline scenario
Measurement procedures (if any):	For the measurement campaign of at least 10 days: The measurements should be undertaken during a period that is representative for the typical operation conditions of the plant and ambient conditions of the site (temperature)
Any comment:	Parameter required for Procedure (B): Baseline emissions from organic wastewater

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Data / Parameter:	x
Data unit:	Time
Description:	Representative historical reference period
Source of data:	For existing plants: (a) x should represents one year of historical data; (b) If one year data is not available then x represents a measurement campaign of at least 10 days For Greenfield projects this parameter is not relevant
Measurement procedures (if any):	-
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

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Data / Parameter:	ρ
Data unit:	-
Description:	Discount factor for historical information
Source of data:	For existing plants: (a) If one year of historical data is available ρ=1; (b) If a measurement campaign of at least 10 days is available ρ=0.89 For Greenfield projects: ρ=1
Measurement procedures (if any):	The value of 0.89 for the case where there is no one year historical data is to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

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Data / Parameter:	B_O
Data unit:	$tCH_4/tCOD$
Description:	Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand (COD)
Source of data:	2006 IPCC Guidelines
Measurement procedures (if any):	No measurement procedures. The default IPCC value for B_o is 0.25 kg CH_4/kg COD shall be used. Unless the methodology is used for wastewater containing materials not akin to simple sugars, a CH_4 emissions factor different from 0.21 $tCH_4/tCOD$ has to be applied
Any comment:	For the calculation of baseline emissions, taking into account the uncertainty of this estimate, project participants should use a value of 0.21 kg CH_4/kg COD as a conservative assumption for B_o . For the calculation of project emissions project participants shall use a value of 0.21 kg CH_4/kg COD.

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Data / Parameter:	D
Data unit:	m
Description:	Average depth of the lagoons
Source of data:	For existing plants: Conduct measurements For project activities implemented in Greenfield facilities: As per the baseline lagoon design as identified in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario Identification of alternative scenarios"
Measurement procedures (if any):	Determine the average depths of the whole lagoon under normal operating conditions
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

766 III. MONITORING METHODOLOGY

767 Data and parameters monitored

Data / Parameter:	$RATE_{compliance,y}$
Data unit:	Fraction
Description:	Rate of compliance with a regulatory requirement to implement the alternative waste treatment option(s) implemented in the project activity
Source of data:	Studies and official reports, such as annual reports provided by municipal bodies
Measurement procedures (if any):	Fraction is calculated as the number of instances of compliance divided by the number of instances of compliance plus non-compliance
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	Applicable to calculating baseline emissions and confirming applicability of the methodology

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Data / Parameter:	$NCV_{fuel,y}$
Data unit:	TJ/Nm^3
Description:	Net Calorific Value of upgraded biogas sent to the natural gas network due to the project activity in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Measured directly using an online Heating Value Meter from the gas stream. The measurement must be in volume basis and adjusted to reference conditions
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	Applicable to baseline emissions procedure (D)

769

Data / Parameter:	$NCV_{BIOGAS,NG,y}$
Data unit:	TJ/Nm^3
Description:	Net Calorific Value of upgraded biogas sent to the natural gas network due to the project activity in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Measured directly using an online Heating Value Meter from the gas stream. The measurement must be in volume basis and adjusted to reference conditions
Monitoring frequency:	Continuous
QA/QC procedures:	Flow meters shall be subject to a regular maintenance and testing regime to ensure accuracy. Calibration shall be according to manufacturers specifications
Any comment:	Applicable to baseline emissions procedure (D)

770

771

Data / Parameter:	$BIOGAS_{NG,y}$
Data unit:	Nm^3/yr
Description:	Amount of upgraded biogas sent to the natural gas network due to the project activity in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Measured by a flow meter and adjusted to reference conditions. Data to be aggregated monthly and yearly
Monitoring frequency:	Continuous (average value in a time interval not greater than an hour shall be used in the calculations of emission reductions)
QA/QC procedures:	Flow meters shall be subject to a regular maintenance and testing regime to ensure accuracy. Calibration shall be according to manufacturers specifications
Any comment:	Applicable to Procedure (D)

772

Data / Parameter:	$EF_{COM,y}$
Data unit:	Fraction
Description:	Combustion efficiency of combustor *c* in year *y*
Source of data:	The source of data shall be the following, in order of preference: 1. project specific data; 2. country specific data; or 3. IPCC default values
Measurement procedures (if any):	-
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain

773

Data / Parameter:	$SG_{c,y}$
Data unit:	m^3 / yr
Description:	Volume of stack gas from combustor *c* in year *y*
Source of data:	Project participants
Measurement procedures (if any):	The stack gas flow rate is either directly measured or calculated from other variables where direct monitoring is not feasible. Where there are multiple stacks of the same type, then it is sufficient to monitor one stack of each type. For the case that biogas is combusted, then the stack gas volume flow rate may be estimated by summing the inlet biogas and air flow rates and adjusting for stack temperature. Direct measurement of the air inlet flow rate shall be made using a flow meter
Monitoring frequency:	Continuous or periodic (at least quarterly)
QA/QC procedures:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected
Any comment:	-

774

775

Data / Parameter:	$C_{N2O,SG,c,y}$
Data unit:	$t\ N_2O\ /\ m^3$
Description:	Concentration of N_2O in stack gas from combustor *c* in year *y*
Source of data:	Project participants
Measurement procedures (if any):	-
Monitoring frequency:	At least every three months
QA/QC procedures:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected
Any comment:	More frequent sampling is encouraged

776

Data / Parameter:	$C_{CH4,SG,c,y}$
Data unit:	$t\ CO_2e\ /\ t\ CH_4$
Description:	Concentration of CH_4 in stack gas from combustor *c* in year *y*
Source of data:	Project participants
Measurement procedures (if any):	-
Monitoring frequency:	At least every three months
QA/QC procedures:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected
Any comment:	More frequent sampling is encouraged

777

Data / Parameter:	$Q_{waste,c,y}$
Data unit:	t
Description:	Quantity of fresh waste fed into combustor *c* the in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Measured with calibrated scales or load cells
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	-
Any comment:	-

778

Data / Parameter:	$Q_{waste,c,y}$
Data unit:	t
Description:	Quantity of fresh waste fed into combustor *c* the in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Measured with calibrated scales or load cells
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	
Any comment:	Parameter required for procedure to calculate Project emissions from combustion within the project boundary

Data / parameter:	$p_{n,j,y}$
Data unit:	Weight fraction
Description:	Fraction of waste type *j* in the sample *n* collected during the year *y*
Source of data:	Sample measurements by project participants
Measurement procedures (if any):	-
Monitoring frequency:	A minimum of three samples shall be undertaken every three months with the mean value valid for year *y*
QA/QC procedures:	-
Any comment:	-

779

Data / Parameter:	z_y
Data unit:	-
Description:	Number of samples collected during the year *y*
Source of data:	Project participants
Measurement procedures (if any):	-
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures:	-
Any comment:	-

780

Data / Parameter:	$EC_{t,y}$
Data unit:	MWh
Description:	Electricity consumption of electricity generated in an on-site fossil fuel fired power plant or from the grid as a result of the alternative waste treatment option *t* in year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	Sources of consumption shall include the operation of the alternative waste treatment process, on-site processing or management of the feedstock or products associated with the treatment process and on-site combustion activity. Electricity consumption shall be monitored for all activities included in the project boundary, associated with the treatment option, as illustrated in Appendix 1
Monitoring frequency:	Continuous
QA/QC procedures:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company
Any comment:	This parameter is required for calculating project emissions from electricity consumption due to an alternative waste treatment process *t* ($PE_{EC,t,y}$) using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” $EG_{EC,t,y}$ excludes consumption of any electricity generated by the project activity. In case of consumption of electricity generated by the project by RDF/SB combustion or incineration, then emissions associated with combustion of fossil carbon content of the waste are accounted for in the procedure *Project emissions from combustion*, and do not need to be accounted for again in the procedure *Project emissions from electricity use*

Data / Parameter:	$EG_{t,y}$
Data unit:	MWh
Description:	Electricity generated by the alternative waste treatment option *t* and exported to the grid or displacing fossil fuel fired cogneration or captive energy generation in year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	-
Monitoring frequency:	Continuous
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$EG_{INC,y}$
Data unit:	TJ
Description:	Amount of electricity generated by incineration during the year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	-
Monitoring frequency:	Continuous
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$HG_{PJ,y}$
Data unit:	TJ
Description:	Quantity of heat supplied by the project activity displacing baseline heat generation by a fossil fuel cogeneration plant, boiler or air heater in year *y*
Source of data:	Steam meter
Measurement procedures (if any):	-In case of steam meter: The enthalpy of steam and feed water will be determined at measured temperature and pressure and the enthalpy difference will be multiplied with quantity measured by steam meter. -In case of hot air: the temperature, pressure and mass flow rate will be measured
Monitoring frequency:	Monthly
QA/QC procedures:	In case of monitoring of steam, it will be calibrated for pressure and temperature of steam at regular intervals. The meter shall be subject to regular maintenance and testing to ensure accuracy
Any comment:	The dedicated quantity of thermal energy generated for heat supply or cogeneration by the project activity if included

785

Data / Parameter:	$HG_{INC,y}$
Data unit:	TJ
Description:	Net quantity of thermal energy generated by incineration in year *y*
Source of data:	Steam meter
Measurement procedures (if any):	-In case of steam meter: The enthalpy of steam and feed water will be determined at measured temperature and pressure and the enthalpy difference will be multiplied with quantity measured by steam meter. -In case of hot air: the temperature, pressure and mass flow rate will be measured.
Monitoring frequency:	Monthly
QA/QC procedures:	In case of monitoring of steam, it will be calibrated for pressure and temperature of steam at regular intervals. The meter shall be subject to regular maintenance and testing to ensure accuracy.
Any comment:	The dedicated quantity of thermal energy generated for heat supply or cogeneration by the project activity if included

786

Data / Parameter:	EF_{N2O}
Data unit:	kg N_2O / tonne waste (dry)
Description:	Aggregate N_2O emission factor for waste incineration
Source of data:	As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

787

Data / Parameter:	EF_{CH4}
Data unit:	kg N_2O / tonne waste (dry)
Description:	Aggregate CH_4 emission factor for waste incineration
Source of data:	As per guidance from the Board, IPCC default values shall be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

788

789

Data / Parameter:	$Q_{RDFSB,COM,,y}$
Data unit:	t
Description:	Quantity of RDF/SB exported off-site with potential to be combusted in year *y*
Source of data:	Project Site
Measurement procedures (if any):	Sale invoices of the RDF/SB should be kept at the project site. They shall contain customer contact details, physical location of delivery, type, amount (in tons) and purpose of RDF/SB(use as fuel or as material in furniture etc.). A list of customers and delivered SD amount shall be kept at the project site
Monitoring frequency:	Weekly
QA/QC procedures:	-
Any comment:	See procedure to calculate leakage emissions associated with RDF/SB for further information

790

Data / Parameter:	Temperature of the thermal treatment process
Data unit:	-
Description:	The thermal treatment process (dehydration) occurs under controlled conditions (up to 300 degrees Celsius)
Source of data:	Project site
Measurement procedures (if any):	-
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

791

Data / Parameter:	$Q_{export,RDFSB,y}$
Data unit:	t
Description:	Quantity of RDF/SB exported outside the project boundary that is considered to degrades anaerobically in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Weighbridge. All RDF/SB for which documented evidence is not available that it is combusted, or used for fertilizer of furniture manufacture
Monitoring frequency:	Annually
QA/QC procedures:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Any comment:	-

792

Data / Parameter:	$Q_{RDFSB,y}$
Data unit:	t
Description:	Quantity of RDF/SB produced in year *y*
Source of data:	Project participants
Measurement procedures (if any):	Weighbridge

Monitoring frequency:	Annually
QA/QC procedures:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
Any comment:	-

Data / Parameter:	$Q_{ww,y}$
Data unit:	m^3
Description:	Amount of run-off wastewaster generated by the project activity and treated anaerobically or released untreated from the project activity in year *y*
Source of data:	Measured value by flow meter
Measurement procedures (if any):	-
Monitoring frequency:	Monthly, aggregated annually
QA/QC procedures:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy
Any comment:	If the wastewater is treated aerobically, emissions are assumed to be zero, and hence this parameter does not need to be monitored

Data / Parameter:	$P_{COD,y}$
Data unit:	t COD / m^3
Description:	COD of the wastewater generated by the project activity in year *y*
Source of data:	Measured value by purity meter or COD meter
Measurement procedures (if any):	-
Monitoring frequency:	Monthly and averaged annually
QA/QC procedures:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy
Any comment:	If the wastewater is treated aerobically, emissions are assumed to be zero, and hence this parameter does not need to be monitored

Data / Parameter:	$EG_{INC,FF,y}$
Data unit:	MJ
Description:	Energy generated by auxiliary fossil fuel added in the incinerator
Source of data:	Project site
Measurement procedures (if any):	This parameter will be estimated multiplying the amount of auxiliary fossil fuel added in the incinerator to the net calorific value of this auxiliary fossil fuel
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	This parameter will be used to assess that the fraction of energy generated by fossil fuel is no more than 50% of the total energy generated in the incinerator. $EG_{INC,FF,y} < 0.50 \text{ x } (HG_{INC,y} + EG_{INC,y})$

<table>
<tr><td>Data / Parameter:</td><td>$EF_{CO2,RDFSB,y}$</td></tr>
<tr><td>Data unit:</td><td>t CO_2 / GJ</td></tr>
<tr><td>Description:</td><td>Weighted average CO_2 emission factor for RDF/SB in year <i>y</i></td></tr>
<tr><td>Source of data:</td><td>$EF_{CO2,RDFSB,y}$ is zero for biomass residues, otherwise determine from one of the following sources:
<table>
<tr><th>Data source</th><th>Conditions for using the data source</th></tr>
<tr><td>a) Measurements by the project participants</td><td>This is the preferred data source</td></tr>
<tr><td>b) IPCC default values at the upper/lower limit[6] of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories</td><td>If a) is not available</td></tr>
</table></td></tr>
<tr><td>Measurement procedures (if any):</td><td>For a): Measurements shall be undertaken in line with national or international fuel standards</td></tr>
<tr><td>Monitoring frequency:</td><td>For a): The CO_2 emission factor shall be obtained for each shipment of RDF/SB exported from the project site for which there is documented evidence that it will be combusted, from which weighted average annual values shall be calculated
For b): Any future revision of the IPCC Guidelines shall be taken into account</td></tr>
<tr><td>QA/QC procedures:</td><td>According to ISO 9000 or similar quality systems</td></tr>
<tr><td>Any comment:</td><td>This parameter is required for the procedure to calculate leakage emissions for the combustion of RDF/SB outside the project boundary</td></tr>
</table>

Data / Parameter:	$NCV_{RDFSB,y}$
Data unit:	GJ / mass or volume units
Description:	Weighted average net calorific value of RDF/SB in year *y*
Source of data:	Measurements by the project participants
Measurement procedures (if any):	Measurement is not required for RDF/SB produced wholly from biomass residues, otherwise measurements shall be undertaken in line with national or international fuel standards
Monitoring frequency:	The NCV shall be obtained for each shipment of RDF/SB exported from the project site for which there is documented evidence that it will be combusted, from which weighted average annual values shall be calculated
QA/QC procedures:	Verify if the values are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories should have ISO17025 accreditation or justify that they can comply with similar quality standards
Any comment:	This parameter is required for the procedure to calculate leakage emissions for the combustion of RDF/SB outside the project boundary

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[6] To be conservative, choose the upper limit where project emissions are calculated and the lower limit where baseline emissions are calculated.

800

Data / Parameter:	$F_{PJ,dig,m}$
Data unit:	m³/month
Description:	Quantity of fresh wastewater that is treated in the anaerobic digester or by co-composting in the project activity in month *m*
Source of data:	Measured
Measurement procedures (if any):	-
Monitoring frequency:	Parameter monitored continuously but aggregated monthly and annually for calculations
QA/QC procedures:	-
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

801

Data / Parameter:	$COD_{,dig,m}$
Data unit:	T COD/m³
Description:	Chemical oxygen demand in the fresh wastewater that is treated in the anaerobic digester or by co-composting in the project activity in month *m*
Source of data:	Measurements
Measurement procedures (if any):	Measure the COD according to national or international standards. If COD is measured more than once per month, the average value of the measurements should be used
Monitoring frequency:	Regularly, calculate average monthly and annual values
QA/QC procedures:	-
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

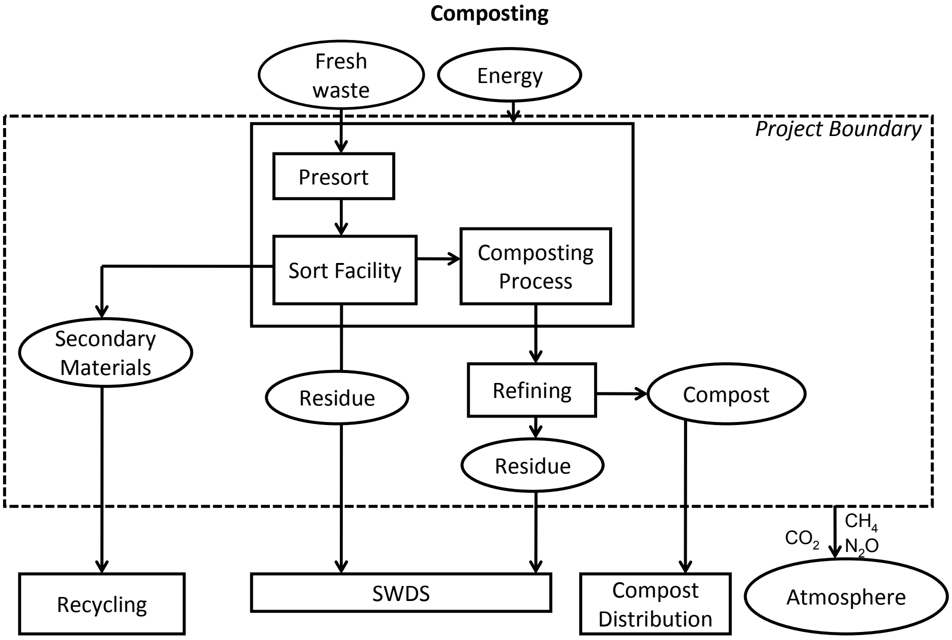
802

Data / Parameter:	$T_{2,m}$
Data unit:	K
Description:	Average temperature at the project site in month *m*
Source of data:	Measurement in the project site, or National or regional weather statistics
Measurement procedures (if any):	In case that project participants decide to measure temperature in the project site: • The temperature sensor must be housed in a ventilated radiation shield to protect the sensor from thermal radiation
Monitoring frequency:	Continuously, aggregated in monthly average values
QA/QC procedures:	In case that project participants decide to measure temperature in the project site: • Uncertainty of the measurements provided by temperature sensor supplier should be discounted from the readings.
Any comment:	Parameter required for *Procedure (B): Baseline emissions from organic wastewater*

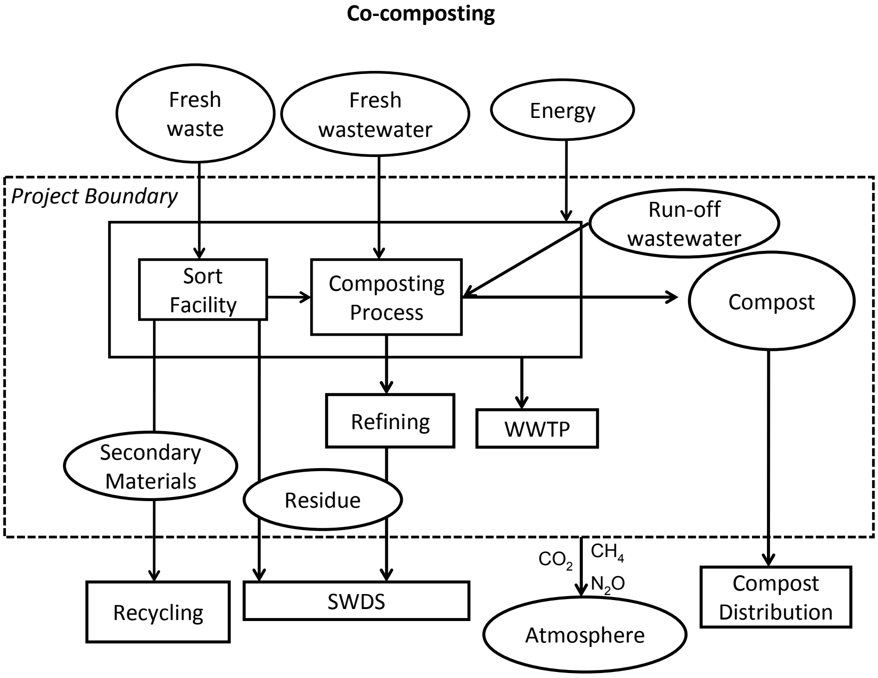
803

804

Appendix 1: Typical boundary layouts of what is included in the project boundary

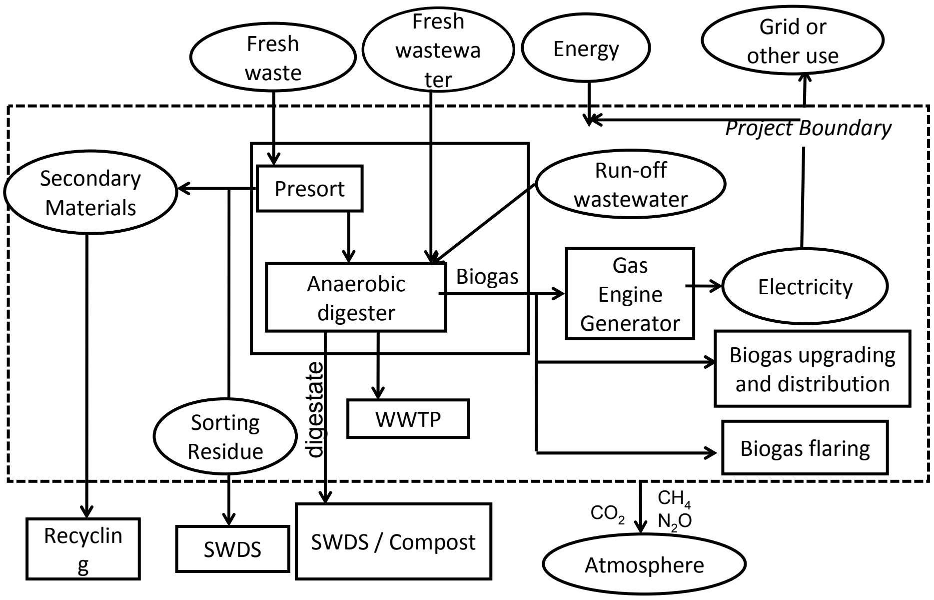


805



806

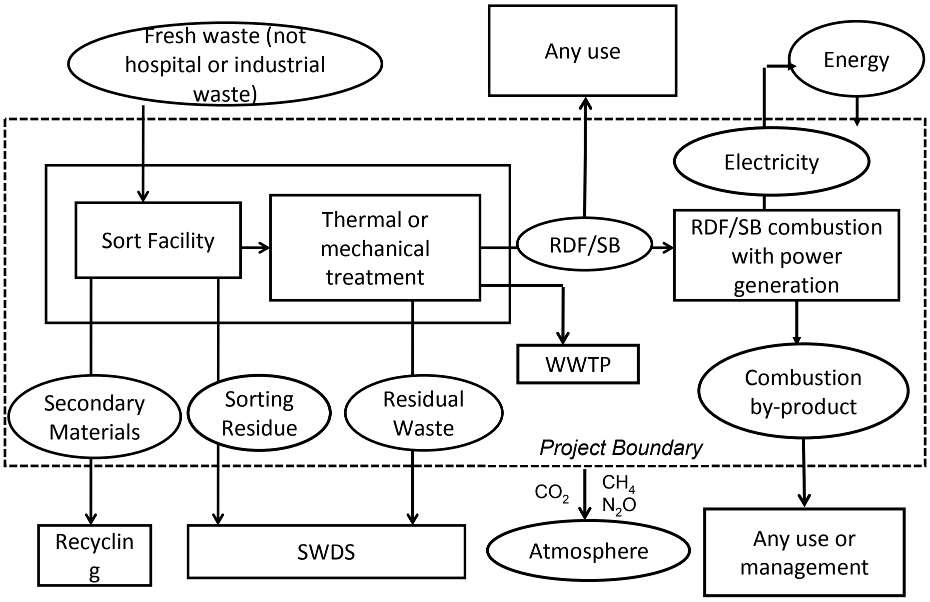
Anaerobic Digestion with biogas collection and flaring and/or its use



807

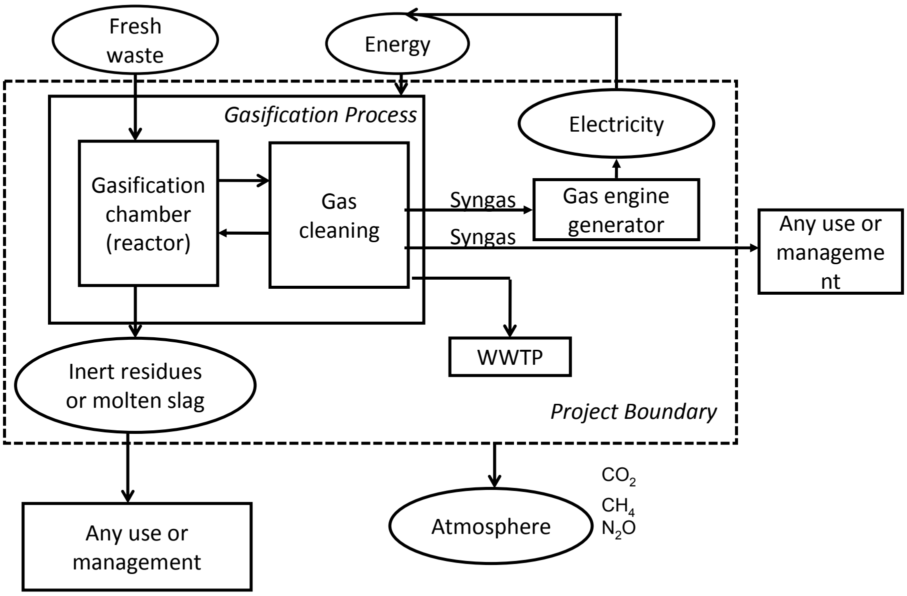
808

Mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and on-site power generation



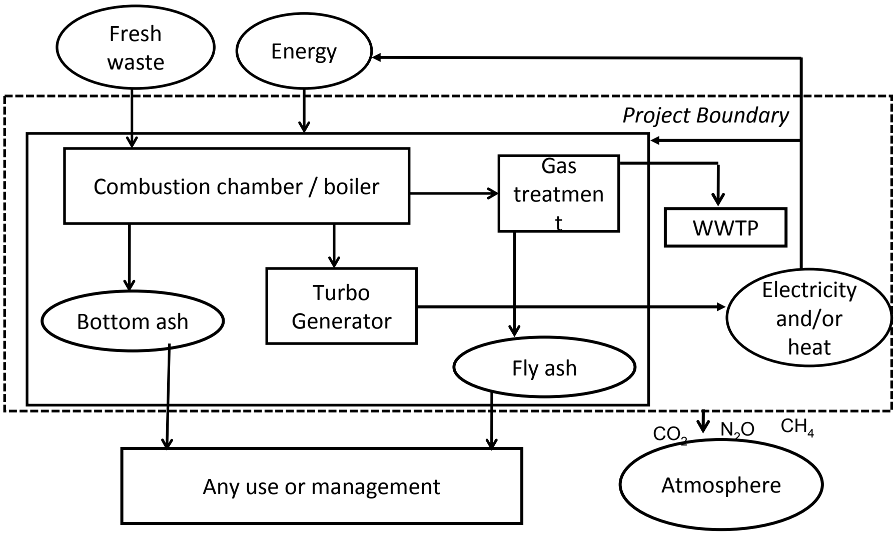
809

Gasification



810

Incineration



811

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History of the document

Version	**Date**	**Nature of revision**
14.0.0	EB 67, Annex # 11 May 2012	Revision to: • Broaden the applicability of the methodology by allowing: o Treatment of wastewater in combination with solid waste, by co-composting or in an anaerobic digester; o Waste by-products of combustion to be exported outside the project boundary; • Neglect transport emissions, emissions associated with combustion of biogas and syngas, methane and nitrous oxide emissions associated with the combustion of RDF/SB, and emissions associated with the management of combustion waste by-products (e.g. ash); • Account for emission reductions from sending upgraded biogas to a natural gas distribution system and removes the reference that the methodology may be used in combination with AM0053. • Include references that the methodology may be used in combination with ACM0003 and ACM0005, so that syngas, RDF/SB and combustion waste by-products may be used in, for example, cement plants. • Change the structure of the methodology and makes other editorial improvements; • Introduce provisions for the use of this methodology in a project activity under a programme of activities (PoA); • Change title from “Avoided emissions from organic waste through alternative waste treatment processes”to “Alternative waste treatment processes”; • Reference these tools: o “Combined tool to identify the baseline scenario and demonstrate additionality”; o “Assessment of the validity of the current/original baseline and update of the baseline at the renewal of the crediting period”; o “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”; o “Tool to calculate the emission factor for an electricity system”; o “Tool to determine the baseline efficiency of thermal or electric energy generation systems”. Due to the overall modification of the document, no highlights of the changes are provided.
13.0.0	EB 65, Annex # 25 November 2011	Revision to: • Change the title of the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site” to “Emissions from solid waste disposal sites”; • Replace the procedures for estimation emissions from composting with a reference to the methodological tool “Project and leakage emissions from composting”.
12	EB 55, Annex 4 30 July 2010	Revision to: • Clarify that project activities that process and upgrade biogas from anaerobic digestion to the quality of natural gas and then distribute it as energy via natural gas distribution grid can use the approved methodology AM0053 in conjunction with this methodology; • Provide separate procedures to estimate emissions from thermal energy generation/electricity generation during co-firing fossil fuel with biomass to allow for cases when the fossil fuel used in the boiler is different than that used for other purposes on-site; • Provide a conservative approach to estimate emissions from residual waste from different treatment processes when disposed of in landfills; • Correct equation 6, so that the Global Warming Potential of methane (GWP_{CH4}) is not taken into account twice.

11	EB 44, Annex 7 28 November 2008	• Addition of a circulating fluidized bed incinerator as a possible technology in the project activity; • Inclusion of an applicability condition to limit the use of auxiliary fossil fuels in the incinerator; • Clarification on the measurement procedure for fossil-based carbon in the waste; • Addition of procedure to estimate leakage emissions from the residual waste from MSW incineration.
10.1	EB 41, Paragraph 26(g) 02 August 2008	The title of the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site” changes to “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”.
10	EB 35, Paragraph 24 19 October 2007	To amend the methodology replacing the reference to ACM0002 by a reference to the “Tool to calculate the emission factor for an electricity system”.
09	EB 33, Annex 8 27 July 2007	To correct an oversight where in the methodology avoidance of methane from anaerobic decay of biomass is credited even for that fraction of biomass, which is identified as not being surplus and thus would not have been dumped and thereby not causing methane emissions.
08	EB 32, Annex 7 22 June 2007	To clarify that the methodology is applicable to project activities: where output of composting activity is disposed of in landfill; and where refuse derived fuel is used for either generation of heat or co-generating energy.
07	EB 31, Annex 5 04 May 2007	To incorporate the proposed new methodology NM0174-rev (MSW Incineration Project in Guanzhuang, Tianjin City, China) expanding its applicability to projects activities that use incineration of municipal solid waste to generate energy.
06	EB 29, Annex 4 16 February 2007	• To incorporate the proposed new methodology NM0178 (Aerobic thermal treatment of municipal solid waste (MSW) without incineration in Parobé); • To revise the procedure for estimating methane emissions from anaerobic pockets of waste being treated through composting.
05	EB 27, Annex 7 1 November 2006	Expand the applicability of the methodology to project activities that use a mechanical process to produce refuse-derived fuel (RDF) for electricity generation from municipal solid waste.
04	EB 26, Annex 9 29 September 2006	Expand the applicability of the methodology to project activities that: • Use anaerobic digestion to treat municipal solid waste, which in absence of the project activity would have been disposed in a landfill; • Are implemented in a country where mandatory regulation exist to treat the biodegradable part of the municipal solid waste before disposing the waste in a landfill, but the regulation is not implemented.
03	EB 23, Annex 6 24 February 2006	• Allow the use of procedure defined in AMS I.D for estimating electricity emission factor if the electricity consumed/supplied meets the eligibility criteria of small scale; • Expand the applicability of the methodology to alternative waste treatment process other than composting.
02	EB 22, Annex 4 25 November 2005	The title was amended in order to clarify that the methodology also applies to organic waste composting that occurs outside the landfill sites.
01	EB 21, Annex 15 30 September 2005	Initial adoption.
Decision Class: Regulatory **Document Type**: Standard **Business Function**: Methodology		