CLEAN DEVELOPMENT MECHANISM

AM0112

Large-scale Methodology

Less carbon intensive power generation through continuous reductive distillation of waste

Version 01.0

Sectoral scope(s): 1 and 13

United Nations
Framework Convention on
Climate Change

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1. Introduction

1. The following table describes the key elements of the methodology:

Table 1. Methodology key elements

Typical project(s)	This methodology applies to project activities where waste is treated by applying continuous reductive distillation (CRD) technology and resultant output gases is used for power generation. The wastes covered under this methodology are municipal solid waste (MSW), biomass residues and tyres
Type of GHG emissions mitigation action	Carbon dioxide and methane. Avoidance of methane generation by treating MSW and biomass residues that would have otherwise been left to decay in a landfill. Power generation using end of life tyres, biomass residues and MSW

1.1. Objectives

2. The objective of this methodology to provide a standard for the waste treatment project activities utilizing CDR technology. The wastes covered under this methodology are municipal solid waste, biomass residue and tyres.

2. Scope, applicability, and entry into force

2.1. Scope

3. This methodology applies to project activities where waste is treated by applying continuous reductive distillation (CRD) technology and resulted output is used for power generation. The project activity may claim emission reductions for:

(a) Displacing electricity in a grid or electricity generation by a fossil fuel fired power-only plant; and

(b) Avoiding methane emissions that are associated with the disposing of municipal solid waste (MSW) and/or biomass residues in a solid waste disposal site (SWDS) with or without a partial LFG capture system.

2.2. Applicability

4. The project activity involves the construction of a new plant to implement CRD process for waste treatment.

5. Only the wastes that are categorized in the methodology can be used by the project facility i.e. MSW, biomass residues and end of life tyres.

6. The co-products (e.g. syn gas, carbon char, emulsion fuel, fuel oil grade 2-4 etc.) of the CRD process should be used within the project boundary. The project proponents shall demonstrate through the mass balance that all the input and outputs are used with in the project boundary.

7. In the case that applicable laws or regulations require the use of the CRD process, the compliance rate of such laws and regulations should be below 50 per cent in the period for which issuance of CERs is requested in order to claim emission reductions for that period.

8. When tyres are used as waste, only End of Life Tyres (ELT) should be used. It shall be demonstrated through receipts from, for example: ELT depot centres where the tyres are supplied; or third parties expert evaluation; or certifications demonstrating the origin and status of tyres used in the project. Project participant can refer to the 'technical guidelines on the identification and management of used tyres' of the Basel convention[1] for ELT tyres.

9. Neither waste nor products and by-products from the waste treatment plant established under the project activity are stored on-site under anaerobic conditions. For example, no organic materials are stored in a stockpile that is considered a SWDS.

10. When the biomass residues are used as a waste from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process.

11. When the biomass residues are used as a waste it should not be obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical- degradation, etc.).

12. The project does not reduce the amount of waste that would be recycled in the absence of the project activity. Detailed justifications shall be provided and documented in the CDM-PDD for demonstrating that the project activity does not reduce the amount of waste that would be recycled in the absence of the project activity.

13. In addition, the applicability conditions included in the tools referred to below apply.

14. Finally, the methodology is only applicable if the procedure for the selection of the most plausible baseline scenario, as outlined below, results in that the baseline scenario is:

    (a) Power generation in the absence of the project activity is either P2, P3, P4 or any combination of P2, P3 and P4;

    (b) The use of biomass residues in the absence of the project activity is either B2, B3, B4 or any combination of B2, B3 and B4;

    (c) The treatment of MSW in the absence of the project activity is either F2 and/or F3;

    (d) The treatment of tyres in the absence of the project activity is W2 and/or W4.

2.3. Entry into force

15. The date of entry into force is the date of the publication of the EB 75 meeting report on the 4 October 2013.

[1] Basel Convention, Technical Guidelines on the Identification and Management of Used Tyres, 1999, ISBN : 92-1-158610-0.

3. Normative references

16. This baseline and monitoring methodology is based on the following proposed new methodology:

    (a) “NM0365: Less carbon intensive power generation through Continuous Reductive (‘Alambic’) Distillation of wastes containing biogenic and fossil fuel-based carbon".

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

    (a) “Combined tool to identify the baseline scenario and demonstrate additionality”;

    (b) “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”;

    (c) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”;

    (d) The methodological tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”;

    (e) The methodological tool “Emissions from solid waste disposal sites”;

    (f) The methodological tool “Project and leakage emissions from anaerobic digestion”.

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

4. Definitions

19. The definitions contained in the Glossary of CDM terms shall apply.

20. For the purpose of this methodology, the following definitions apply:

    (a) **Carbon char** - solid matter remaining after CRD process which has a high enough calorific value that when pelletized with a binding agent can be used as solid fuel for energy generation;

    (b) **Continuous reductive distillation (CRD)** - a strictly controlled process of thermal treatment of organic and non-organic compounds at moderate controlled temperature (below the dew point of contaminants, hence avoiding the oxidation of metals). The process can convert both biogenic and fossil based material into combustible syngas and other co-products such as carbon char;

    (c) **Co-product** - a product that is produced along with the main product which has similar revenues as the main product. Examples of co-products included carbon char, emulsion fuel, fuel oil, syngas etc.;

    (d) **Emulsion fuel** - a fuel with a composition of up to 20 per cent water, 1 per cent surfactant and 79 per cent fuel;

(e) **Fuel oil** - the condensable fraction of the syngas gas from the CRD process is a fuel oil of grade 2–4. Fuel oil is easily burned and is classed as distillate oil, which is very fluid at room temperature. The fuel oil can be directly used in power generation equipment;

(f) **Processing capacity -** the maximum processing capacity of the plant shall be the maximum daily production multiplied by 365 days multiplied by the operational rate. In case the plant is having less than three years operational history this should be considered as the installed capacity provided by manufacturer/supplier of the plant;

(g) **Run-off wastewater** - wastewater that is generated as a by-product from a waste treatment plant established under the project activity;

(h) **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);

(i) **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;

(j) **Sub-process** - part of the CRD process or supporting process within the project boundary. An example of a supporting process is the pelletization of carbon char before it is fed into a boiler/steam turbine;

(k) **Syngas** - a gas mixture consisting primarily of carbon monoxide and hydrogen and small amounts of carbon dioxide. It is produced from CRD process and used as a fuel for energy generation;

(l) **Waste** - for this methodology MSW, biomass residue and tyres are considered as waste:

   (i) **End of life Tyres (ELT)** - tyres (tires in US English) include auto, truck, and other type of tyres that are at the end of their useful life and are discarded, landfilled, down cycled (recycled to a product with lesser value and material qualities), recycled or otherwise but not used for their primary function anymore (transport). Tyres may be shredded before being used in the CRD process;

   (ii) **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.

5. Baseline methodology

5.1. Project boundary

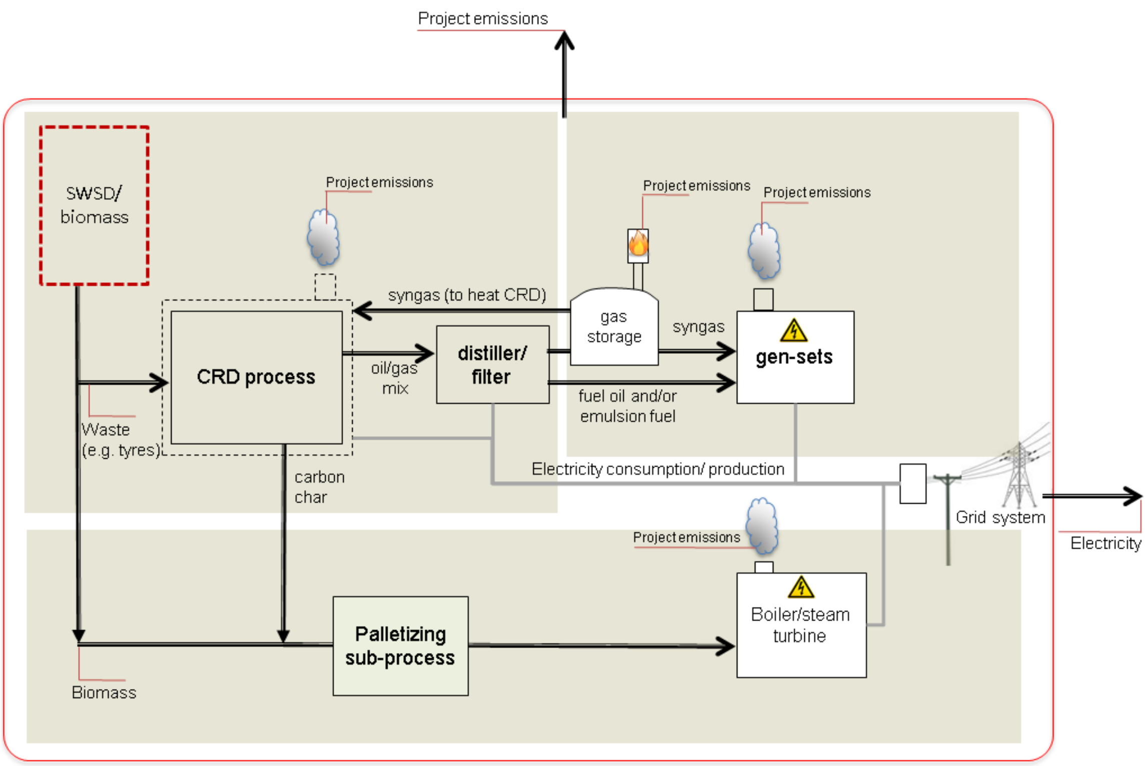
21. Figure 1 presents the spatial extent of the project boundary, which encompasses the physical boundary of the particular CRD process plant.

22. The project boundary includes those grid-connected and/or off-grid plants connected to an electricity system (e.g. national/local grid) to which the plant is connected.

23. The spatial extent of the project boundary also includes the SWDS where the waste is disposed of in the baseline.

24. The boundary also includes on-site electricity generation, export and consumption, on-site co-product production/consumption and any wastewater treatment facility used to treat the run-off wastewater.

Figure 1. Project boundary



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

Table 2. Emission sources included in or excluded from the project boundary

	Source	Gas	Included	Justification/Explanation
Baseline	Fossil fuel in grid	CO_2	Yes	An important emission source. This is the main source of emissions in the baseline due to fossil fuel consumption for power generation by grid-connected power plants within the power grid
		CH_4	No	Excluded for simplification and conservativeness
		N_2O	No	Excluded for simplification and conservativeness
	Methane from SWDS	CO_2	No	Excluded for simplification and conservativeness
		CH_4	Yes	Only included in case of verifiable/quantifiable methane avoidance from organic waste in the baseline
		N_2O	No	Excluded for simplification and conservativeness
Project activity	Emissions from CRD processes	CO_2	Yes	An important project emission source
		CH_4	No	Low emissions. Negligible
		N_2O	No	Low emissions. Negligible
	Emissions from electricity consumption	CO_2	Yes	Project emission source
		CH_4	No	Low emissions. Negligible
		N_2O	No	Low emissions. Negligible
	Emissions from electricity generation (gen-sets)	CO_2	Yes	Project emission source
		CH_4	No	Low emissions. Negligible
		N_2O	No	Low emissions. Negligible
	Emissions from flaring facility	CO_2	Yes	The amount of CO_2 resulting from Syngas combustion
		CH_4	Yes	An important emission in flaring systems when the gas is not completely combusted
		N_2O	No	Low emissions. Negligible
	Emissions from other fossil fuel consumptions in the project boundary not included in the processes	CO_2	Yes	An important project emission source when other fossil fuels are used in the project boundary; e.g. back-up generators
		CH_4	No	Low emissions. Negligible
		N_2O	No	Low emissions. Negligible

5.2. Selection of the baseline scenario and demonstration of additionality

5.2.1. Identification of the baseline scenario

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

27. When applying Sub-step 1a. of the tool, alternative scenarios should be separately determined for the following components:

    (a) Power generation in the absence of the project activity;

    (b) Use of biomass residues in the absence of the project activity;

    (c) Treatment of MSW in the absence of the project activity;

    (d) Treatment of tyres in the absence of the project activity.

28. The alternative scenarios for power generation in the absence of the project activity shall include, but not be limited to:

    (a) P1: The proposed project activity not undertaken as a CDM project activity;

    (b) P2: The generation of electric power in specific off-site plants, excluding the power grid;

    (c) P3: The generation of electric power in the power grid;

    (d) P4: Existing or new on-site or off-site fossil fuel fired electricity plant;

    (e) P5: Existing or new on-site or off-site renewable based electricity plant.

29. The alternative scenarios for use of biomass residues in the absence of the project activity shall include, but not be limited to:

    (a) B1: The proposed project activity not undertaken as a CDM project activity;

    (b) B2: The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields;

    (c) B3: The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills which are deeper than five meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;

    (d) B4: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;

    (e) B5: The biomass residues are used for electric power or heat generation at the project site in new and/or existing plants;

    (f) B6: The biomass residues are used for electric power or heat generation at other sites in new and/or existing plants;

(g) B7: The biomass residues are used for other energy purposes, such as the generation of biofuels;

(h) B8: The biomass residues are used for non-energy purposes, for example as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry);

(i) B9: Biomass residues are purchased from a market, or biomass residues retailers, or the primary source of the biomass residues and/or their fate in the absence of the project activity cannot be clearly identified.

30. In identifying baseline alternatives for the treatment of MSW, the following alternatives or combinations of these alternatives shall include but not limited to:

(a) F1: Part proposed project activity not undertaken as a CDM project activity;

(b) F2: Disposal of the MSW in a SWDS with a partial capture of the LFG and flaring of the captured LFG;

(c) F3: Disposal of the MSW in a SWDS without a LFG capture system;

(d) F4: Part of the MSW is recycled and not disposed in the SWDS;

(e) F5: Part of the MSW is treated aerobically and not disposed in the SWDS;

(f) F6: Part of the MSW is incinerated and not disposed in the SWDS;

(g) F7: Part of the MSW is gasified and not disposed in the SWDS;

(h) F8: Part of the MSW is treated in an anaerobic digester and not disposed in the SWDS;

(i) F9: Part of the MSW is mechanically or thermally treated to produce RDF/SB and not disposed in the SWDS.

31. If the project activity uses tyres, project participants should determine what would happen to these tyres in the absence of the project activity, the alternatives to be analysed shall include, inter alia:

(a) W1: The proposed project activity not undertaken as a CDM project activity;

(b) W2: Incineration of the tyres in a waste incinerator without utilizing the energy from the incineration;

(c) W3: Incineration of the tyres in a waste incinerator with utilizing the energy from the incineration (e.g. for heat and/or electricity generation);

(d) W4: Disposal of the tyres at a managed or unmanaged landfill;

(e) W5: The use of the tyres at other facilities, for example other cement or quicklime plants or power plants, as a feedstock or for the generation of energy;

(f) W6: The recycling or reutilization of the tyres.

5.2.2. Additionality

32. The demonstration of additionality shall be conducted using the latest approved version of the "Combined tool to identify the baseline scenario and demonstrate additionality".

5.3. Baseline emissions

33. The baseline emissions are accounted from two sources:

(a) Methane emissions from the SWDS (applicable to the MSW and biomass residue and not applicable for tyres);

(b) Carbon dioxide emissions from electricity generation in the absence of the project activity.

$$BE_y = \left(BE_{CH4,y} + BE_{EG,y}\right) \times DF_{RATE,y}$$ Equation (1)

With

$$DF_{RATE,y} = \begin{cases} 1 - RATE_{compliance,y},\ if\ RATE_{compliance,y} < 0.5 \\ 0,\ if\ RATE_{compliance,y} \geq 0.5 \end{cases}$$ Equation (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)
$BE_{EG,y}$	=	Baseline emissions associated with electricity generation in year *y* (t CO_2)
$DF_{RATE,y}$	=	Discount factor to account for $RATE_{Compliance,y}$
$RATE_{compliance,y}$	=	Rate of compliance of a requirement that mandates the use of CRD waste treatment process in year *y*

5.3.1. Baseline emissions of methane from SWDS ($BE_{CH4,y}$)

34. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are determined using the methodological tool "Emissions from solid waste disposal sites". The following requirements shall be complied with when applying the tool:

(a) $W_{j,x}$ in the tool is the amount of waste prevented from disposal in the baseline SWDS due to CRD process;

(b) 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;

(c) 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 regulation requirements specify a percentage of the LFG that is required to be flared, the amount shall equal f_y;

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

(iii) If the requirement do not specify any amount or percentage of LFG that should be destroyed but require the installation of a system to capture and flare the LFG, then it is assumed f_y = 0.2.

5.3.2. Baseline emissions from electricity generation ($BE_{EG,y}$)

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

(a) 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

(b) $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated by CRD process and exported to the grid or displacing fossil fuel fired power only plants in year *y* ($EG_{s,y}$).

36. Project participants shall demonstrate that the identified baseline fuel used for generation of power 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 periods of the year.

5.4. Project emissions

37. Project emissions in the project can occur from four sources:

(a) Project emission from combustion of fossil waste;

(b) Project emission from electricity consumption;

(c) Project emission from fuel consumption;

(d) Project emission from run-off waste water management.

$$PE_y = PE_{COM,y} + PE_{EC,y} + PE_{PC,y} + PE_{ww,y} \qquad \text{Equation (3)}$$

Where:

PE_y	=	Project emissions in year *y* (t CO_2e)
$PE_{COM,y}$	=	Project emissions from combustion within the project boundary of fossil waste in year *y* (t CO_2)

$PE_{EC,y}$	=	Project emissions from electricity consumption in year *y* (t CO_2e)
$PE_{PC,y}$	=	Project emissions from fossil fuel consumption in year *y* (t CO_2e)
$PE_{ww,y}$	=	Project emissions from the run-off waste water management in year *y* (t CH_4)

5.4.1. Project emissions from combustion within the project boundary of fossil waste ($PE_{COM,y}$)

38. This procedure estimates emissions from CRD process and syngas burners ($PE_{COM,y}$). If there are more than one sub-process used in the project activity, project emissions should be calculated from all sub processes using the equation below. Emissions consist of carbon dioxide, and small amounts of methane and nitrous oxide, as follows:

$$PE_{COM,y} = PE_{COM\_CO2,y} + PE_{COM\_CH4,N20,y} \quad \text{Equation (4)}$$

Where:

$PE_{COM,y}$	=	Project emissions from combustion within the project boundary of fossil waste in year *y* (t CO_2e)
$PE_{COM\_CO2,y}$	=	Project emissions of CO_2 from combustion within the project boundary in year *y* (t CO_2)
$PE_{COM\_CH4,N20,y}$	=	Project emissions of CH_4 and N_2O from combustion within the project boundary in year *y* (t CO_2)

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

39. Carbon dioxide project emissions associated with on-site combustion ($PE_{COM\_CO2,y}$) are calculated based either on the fossil carbon content of the waste or on the fossil carbon content of the stack gas. The biogenic carbon content is not considered.[2]

40. The project participants may select from three options to calculate $PE_{COM\_CO2,y}$.

    (a) **Option 1:** requires sorting the waste into components of waste type *j* and then determining the fossil-based carbon content of each waste type *j;*

    (b) **Option 2:** determines the fossil-based carbon content of the unsorted waste (not applicable for W4 baseline scenario for ELT) ;

    (c) **Option 3:** measures directly the fossil-based carbon content of the stack gas.

41. For CRD process producing syngas for on-site utilisation, the fossil carbon content is determined through the stack gas at the syngas' stack (Option 3). All the syngas has to be combusted.

[2] CO_2 emissions from the combustion or decomposition of *biomass* (see definition by the Board in annex 8 of the Board'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.

42. Project proponent should mention their choice (option) for ex post monitoring during the PDD preparation. For CER estimation any of the method can be used.

5.4.1.1.1. Option 1: Waste sorted into waste type fractions

$$PE_{COM\_C02,y} = \frac{44}{12} \times \sum_{j} Q_{j,y} \times FCC_{j,y} \times FFC_{j,y}$$ Equation (5)

Where:

$PE_{COM\_C02,y}$	=	Project emissions of CO_2 from combustion within the project boundary in year *y* (t CO_2)
$Q_{j,y}$	=	Quantity of waste type *j* fed into CRD process 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)
$\frac{44}{12}$	=	Conversion factor (t CO_2/t C)
j	=	Waste type

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

$$Q_{j,y} = Q_{waste,y} \times \frac{\sum_{n=1}^{z} p_{n,j,y}}{z}$$ Equation (6)

Where:

$Q_{j,y}$	=	Quantity of waste type *j* fed in year *y* (t)
$Q_{waste,y}$	=	Quantity of waste fed 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

5.4.1.1.2. Option 2: Based on unsorted waste

$$PE_{COM\_C02,y} = \frac{44}{12} \times Q_{waste,y} \times FFC_{waste,y}$$ Equation (7)

Where:

$PE_{COM\_C02,y}$	=	Project emissions of CO_2 from combustion within the project boundary in year *y* (t CO_2)
$Q_{waste,y}$	=	Quantity of waste fed in year *y* (t)
$FFC_{waste,y}$	=	Fraction of fossil-based carbon in waste fed in year *y* (t C/t)
$\frac{44}{12}$	=	Conversion factor (t CO_2/t C)

5.4.1.1.3. Option 3: Based on stack gas measurement

$$PE_{COM\_C02,y} = \frac{44}{12} \times SG_y \times FFC_{stack,y} + \left(\frac{44}{12} \times Q_{ELT,y} \times FCC_{ELT,y} \times \left(1 - FFC_{ELT,y}\right)\right)$$ Equation (8)

Where:

$PE_{COM\_C02,y}$	=	Project emissions of CO_2 from combustion within the project boundary in year *y* (t CO_2)
SG_y	=	Volume of stack gas in year *y* (Nm^3)
$FFC_{stack,y}$	=	Concentration of fossil-based carbon in the stack gas in year *y* (t C/Nm^3)
$\frac{44}{12}$	=	Conversion factor (t CO_2/t C)
$Q_{ELT,y}$	=	Quantity of ELT in year *y* (t)
$FCC_{ELT,y}$	=	Fraction of total carbon content in ELT in year *y* (t C/t)
$FFC_{ELT,y}$	=	Concentration of fossil-based carbon in the ELT in year *y* (t C/t)

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

44. Project participants may choose either Option A or Option B to estimate emissions of N_2O and CH_4 from combustion within the project boundary. Option A calculates the emissions based on monitoring the N_2O and CH_4 content in the stack gas. Option B calculates the emissions using default emission factors for the amount of N_2O and CH_4 emitted per tonne of waste combusted.

5.4.1.2.1. Option A: Monitoring the N_2O and CH_4 content in the stack gas

$$PE_{COM\_CH4,N2O,y} = SG_y \times \left(C_{N2O,SG,y} \times GWP_{N2O} + C_{CH4,SG,y} \times GWP_{CH4}\right)$$ Equation (9)

Where:

$PE_{COM\_CH4,N2O,y}$	=	Project emissions of CH_4 and N_2O from combustion within the project boundary of fossil carbon in year *y* (t CO_2)
SG_y	=	Volume of stack gas in year *y* (Nm^3)
$C_{N2O,SG,y}$	=	Concentration of nitrous oxide in the stack gas in year *y* (t N_2O/Nm^3)
GWP_{N2O}	=	Global Warming Potential of nitrous oxide valid for the commitment period (t CO_2e/t N_2O)
$C_{CH4,SG,y}$	=	Concentration of methane in the stack gas in year *y* (t CH_4/Nm^3)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (t CO_2e/t CH_4)

5.4.1.2.2. Option B: Using default emission factors

$$PE_{COM\_CH4,N2O,y} = Q_{waste,y} \times (EF_{N2O} \times GWP_{N2O} + EF_{CH4} \times GWP_{CH4}) \qquad \text{Equation (10)}$$

Where:

$PE_{COM\_CH4,N2O,y}$	=	Project emissions of CH_4 and N_2O from combustion within the project boundary in year *y* (t CO_2)
$Q_{waste,y}$	=	Quantity of waste fed in year *y* (t)
EF_{N2O}	=	Emission factor for N_2O associated with CRD process (t N_2O/t waste)
EF_{CH4}	=	Emission factor for CH_4 associated with CRD process (t CH_4/t waste)
GWP_{N2O}	=	Global Warming Potential of nitrous oxide valid for the commitment period (t CO_2e/t N_2O)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (t CO_2e/t CH_4)

5.4.2. Project emissions from electricity use (*$PE_{EC,y}$*)

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

    (a) Project emissions shall be calculated for the sources of electricity consumed due to the CRD process, excluding consumption of electricity that was generated by the project activity (EC_y).

5.4.3. Project emissions from fossil fuel use (*$PE_{FC,y}$*)

46. The project emissions from fossil fuel combustion in CRD process ($PE_{FC,y}$) shall be calculated using the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”. When applying the tool:

(a) Processes *j* in the tool correspond to the sources of fossil fuel consumption due to the CRD process, other than for electricity generation. Consumption sources shall include, as relevant, fossil fuels used for starting the CRD process, auxiliary fossil fuels, and fuels for sub processes like pelletization, for operating the CRD process catalyst, and on-site fossil fuel combustion during co-firing with waste. Fossil fuels used as part of the on-site processing or management of feedstock and by-products shall also be included.

5.4.4. Emissions from run-off wastewater management (*PEww,y*)

47. 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 tool "Project and leakage emissions from anaerobic digestion".

48. If the project activity generates run-off wastewater that is treated anaerobically, stored anaerobically or released untreated, then project participants shall determine $PE_{ww,y}$, with the following equation.

$$PE_{ww,y} = Q_{ww,y} \times P_{COD,y} \times 0.25 \times 0.8 \times GWP_{CH4} \quad \text{Equation (11)}$$

Where:

$PE_{ww,y}$	=	Project emissions of methane from run-off wastewater associated CRD process in year *y* (t CO_2e)
$Q_{ww,y}$	=	Amount of run-off wastewater generated by the project activity and treated anaerobically or released untreated from the project activity in year *y* (m^3)
$P_{COD,y}$	=	COD of the run-off wastewater generated by the project activity in year *y* (tCOD/m^3)
0.25	=	Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand (t CH_4/tCOD). Default value based on 2006 IPCC guidelines
0.8	=	Methane conversion factor (fraction). Default value based on 2006 IPCC guidelines
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (t CO_2e/t CH_4)

5.5. Leakage

49. The leakage may occur from increase transportation for waste in the project activity.

$$LE_y = LE_{Trans,y} \quad \text{Equation (12)}$$

Where:

LE_y	=	Leakage emissions in year *y* (t CO_2/y)
$LE_{Trans,y}$	=	The increase from fossil fuel for transportation of the CRD input waste compared to the baseline (t CO_2/y)

5.5.1. Determination of the increase from fossil fuel due to increase in transport of wastes due to the project activity ($LE_{Trans,y}$)

50. For waste only incremental transport needs to be taken into account. If transport due to the project activity increases compared to the baseline scenario, $LE_{Trans,y}$ for transport of waste needs to be taken into account as follows:

$$LE_{Trans,y} = \left(Q_y / CT_y\right) \times DAF_w \times EF_{CO2,transport} x 10^{-6}$$ Equation (13)

Where:

Q_y	=	Quantity of waste treated in year *y* (tonnes)
CT_y	=	Average truck capacity for transportation (tonnes/truck)
DAF_w	=	Average incremental distance for raw solid waste (MSW, tyres and biomass residue)transportation (km/truck)
$EF_{CO2,transport}$	=	CO_2 emission factor from fuel use due to transportation (gCO_2/t km, IPCC default values or local values may be used)
10^{-6}	=	Conversion factor from gCO_2 to ton CO_2

5.6. Emission reductions

51. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$ Equation (14)

Where:

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

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

52. Refer to the latest approved version of the methodological tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period”.

5.8. Data and parameters not monitored

53. In addition to the parameters listed here, the provisions on data and parameters not monitored in the tools referred to in this methodology apply.

Data / Parameter table 1.

<table>
<tr><td>Data / Parameter:</td><td>FFC_j</td></tr>
<tr><td>Data unit:</td><td>weight fraction</td></tr>
<tr><td>Description:</td><td>Fraction of fossil carbon in total carbon content of waste type j in year y</td></tr>
<tr><td>Source of data:</td><td>Table 2.4, chapter 2, volume 5 of IPCC 2006 guidelines</td></tr>
<tr><td>Measurement procedures (if any):</td><td>For MSW the following values for the different waste types j may be applied:
Table 3: Default values for $FFC_{j,y}$
<table>
<tr><td>Waste type j</td><td>Default: The methodology's default is the largest value of the range of Table 2.4/Chapter2/Vol.5/2006 IPCC Guidelines</td></tr>
<tr><td>Paper/cardboard</td><td>5</td></tr>
<tr><td>Textiles</td><td>50</td></tr>
<tr><td>Food waste</td><td>-</td></tr>
<tr><td>Wood</td><td>-</td></tr>
<tr><td>Garden and Park waste</td><td>0</td></tr>
<tr><td>Nappies</td><td>10</td></tr>
<tr><td>Rubber and Leather</td><td>20</td></tr>
<tr><td>Plastics</td><td>100</td></tr>
<tr><td>Metal*</td><td>NA</td></tr>
<tr><td>Glass*</td><td>NA</td></tr>
<tr><td>Other, inert waste</td><td>100</td></tr>
</table>
*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 above, or cannot 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 both the following standards, or similar national or international standards:
• ASTM D6866: "Standard Test Methods for Determining the Bio-based 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</td></tr>
<tr><td>Any comments:</td><td>The value 100 should be used for Tyres and 0 for biomass residue. In case of w4 baseline scenario for ELT full carbon (fossil based and biogenic) should be monitored</td></tr>
</table>

Data / Parameter table 2.

Data / Parameter:	**$FCC_{j,y}$**
Data unit:	tC/t
Description:	Carbon content in waste type *j* in year *y*
Source of data:	Default values per waste type from IPCC reports or certified lab test of the waste
Measurement procedures (if any):	For measuring FCCj,, project participants shall use the following standard, or similar national or international standards: • 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*
Any comments:	-

Data / Parameter table 3.

Data / Parameter:	**GWP_{CH4}**
Data unit:	t CO_2e/t CH_4
Description:	Global Warming Potential of methane valid for the commitment period
Source of data:	IPCC
Measurement procedures (if any):	25. Shall be updated for future commitment periods according to any future COP/MOP decisions
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	**GWP_{N2O}**
Data unit:	t CO_2e/t N_2O
Description:	Global Warming Potential of N_2O valid for the commitment period
Source of data:	IPCC
Measurement procedures (if any):	298. Shall be updated for future commitment periods according to any future COP/MOP decisions
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	**$EF_{CO2,transport}$**
Data unit:	g CO_2/t km
Description:	Default CO_2 emission factor for transportation
Source of data:	IPCC

Measurement procedures (if any):	**Table 4: Emission factor from transportation** **Vehicle class** / **Emission factor (g CO_2/t km)** Light vehicles / 245 Heavy vehicles / 129
Any comment:	The default CO_2 emission factors take into account emissions generated by loaded outbound trips and empty return trips. The default emission factors have been obtained from two sources. For light vehicles, the emission factor was obtained from empirical data from European vehicles.[3] For heavy vehicles, the emission factor has been derived based on custom design transient speed-time-gradient drive cycle (adapted from the international FIGE cycle), vehicle dimensional data, mathematical analysis of loading scenarios, and dynamic modelling based on engine power profiles, which, in turn, are a function of gross vehicle mass (GVM), load factor, speed/acceleration profiles and road gradient. The following assumptions on key parameters have been made: an average driving speed of 30 km/h, an average gradient of 1 per cent, and a load factor attained when biomass[4] is transported were assumed

Data / Parameter table 6.

Data / Parameter:	**$EF_{CH4,t}$**
Data unit:	t CH_4/t waste (wet basis)
Description:	Emission factor for CH_4 associated with CRD process
Source of data:	Table 5.3, 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: CH_4 emission factors for combustion** Waste type / CH_4 emission factors (t CH_4/t waste) wet basis MSW / $1.21 \times 0.2 \times 10^{-6}$ A conservativeness factor of 1.21 has been applied to account for the uncertainty of the IPCC default values. Highest values is used for MSW
Any comment:	Applicable to Option B of procedure to estimate $PE_{COM,y}$

[3] Les émissions de CO_2 par les poids lourds français entre 1996 et 2006 ont augmenté moins vite que les volumes transportés'. Commissariat Général au Développement Durable. # 25, 2009.

[4] Biomass is the most commonly transported material in existing CDM projects where transportation is not the main project activity. Due to a low bulk density of biomass, volumetric loading was used to derive the emission factor assuming that project proponents will extent the height of side panels to the height of 2.4 m to maximize their trip efficiency.

Data / Parameter table 7.

<table>
<tr><th>Data / Parameter:</th><th>$EF_{N2O,t}$</th></tr>
<tr><td>Data unit:</td><td>t N_2O/t waste (wet basis)</td></tr>
<tr><td>Description:</td><td>Emission factor for N_2O associated with CRD process</td></tr>
<tr><td>Source of data:</td><td>Table 5.6, 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 6.

Table 6: N_2O emission factors for combustion
<table><tr><td>Type of waste</td><td>Emission factor
(t N_2O/t waste wet basis)</td></tr><tr><td>MSW</td><td>$1.21 \times 50 \times 10^{-6}$</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 B, of procedure to estimate $PE_{COM,y}$</td></tr>
</table>

6. Monitoring methodology

6.1. Archival of monitoring information

54. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period. One hundred per cent of the data should be monitored if not indicated otherwise in the tables below.

6.2. Monitoring and QA/AC information

55. In the CDM-PDD, project proponents have to provide information concerning the system in place to ensure the quality of the data. It should include the actions to be undertaken to constitute and to maintain the needed measurement equipment to satisfy the requirements concerning the quality of the data:

(a) The inventory, identification and the description of the measurement equipment used;

(b) The description of the QA/QC procedures for monitoring;

(c) The organizational structure and the responsibilities;

(d) The calibration and verification of the measurement equipment;

(e) The connecting of standard equipment to data logging devices;

(f) The process of recording data entries.

6.3. Monitoring provisions in the CDM tools

56. The monitoring provisions in the tools referred to in this methodology apply.

6.4. Data and parameters monitored

Data / Parameter table 8.

Data / Parameter:	$FFC_{stack,y}$
Data unit:	t C/Nm^3
Description:	Concentration of fossil-based carbon in stack of processes in the project in year *y*
Source of data:	Project Participant
Measurement procedures (if any):	Directly monitoring the stack gas using a combination of an automated valve with gas sample containers and lab tests. The accuracy shall meet national and/or international standards. The monitoring data will be aggregated by the project monitoring system. The project participants shall measure $FFC_{stack,y}$ using credible, valid sampling methods including national or international standards, namely both of the followings: • ASTM D6866: “Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis”; and • ASTM D7459: “Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil Carbon Dioxide Emitted from Stationary Emissions Sources”. When sampling, the sampling method shall also be performed in line with latest version of ‘Guidelines for sampling and surveys for CDM project activities and programme of activities’
Monitoring frequency:	The system is set to sample the stack gasses through an automated valve. This frequency, should be statistically significant within the required uncertainty range of 10 per cent at a 90 per cent confidence level
QA/QC procedures:	The sample containers shall be analysed using systematic or random sampling and be performed OR accepted (through acceptance sampling[5]) by certified lab. The data shall be aggregated in the project management system. The operator shall produce monthly monitoring reports. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per analysis lab specifications, or at least once a year
Any comment:	This parameter is not applicable for w4 baseline scenario of ELT

Data / Parameter table 9.

Data / Parameter:	$\mathbf{FFC_{ELT,y}}$
Data unit:	t C/t
Description:	Concentration of fossil-based carbon in ELT in the project in year *y*

[5] See appendix C of the “Guidelines for sampling and surveys for CDM project activities and programme of activities”.

Source of data:	Project participant
Measurement procedures (if any):	Monitoring through sampling. The accuracy shall meet national and/or international standards. The monitoring data will be aggregated by the project monitoring system. The project participants shall measure $FFC_{ELT,y}$ using credible, valid sampling methods including national or international standards, namely both of the followings: • ASTM D6866: "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis"; and • ASTM D7459: "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil Carbon Dioxide Emitted from Stationary Emissions Sources". When sampling, the sampling method shall also be performed in line with 'Guidelines for sampling and surveys for CDM project activities and programme of activities' (Version 02.0)
Monitoring frequency:	The frequency of measurement shall be as a minimum four times in year *y* with the mean value valid for year *y.* At this frequency, should be statistically significant within the required uncertainty range of 10 per cent at a 90 per cent confidence level
QA/QC procedures:	The data shall be aggregated in the project management system. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per analysis lab specifications, or at least once a year
Any comment:	If $Q_{ELT,y}$ is the only input in the process during the monitoring period then $FFC_{stack,y}$ may be used instead

Data / Parameter table 10.

Data / Parameter:	**$FCC_{ELT,y}$**
Data unit:	t C/t
Description:	Carbon content in ELT in year *y*
Source of data:	Project participant
Measurement procedures (if any):	For measuring $FCC_{ELT,y}$ project participants shall use the following standard, or similar national or international standards: • ASTM D7459: "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil Carbon Dioxide Emitted from Stationary Emissions Sources"
Monitoring frequency:	The frequency of measurement shall be as a minimum four times in year *y* with the mean value valid for year *y.* This frequency, should be statistically significant within the required uncertainty range of 10 per cent at a 90 per cent confidence level

QA/QC procedures:	The data shall be aggregated in the project management system. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per analysis lab specifications, or at least once a year
Any comment:	-

Data / Parameter table 11.

Data / Parameter:	$\mathbf{Q_{ELT,y}}$
Data unit:	t/y
Description:	Quantity of ELT in year *y*
Source of data:	Direct continuous measurement on site
Measurement procedures (if any):	The input to every single process shall be measured right before consumption using calibrated scales/meters
Monitoring frequency:	Continuous
QA/QC procedures:	The data shall be aggregated in the project management system. The operator shall produce monthly monitoring reports. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per manufacturer's specifications, or at least once a year
Any comment:	This parameter is measured to ensure that produced co-products through the CRD process will not be consumed outside of the project boundary thus avoiding any leakage due to increase of fossil fuel consumption and/or replacement of renewable sources by co-products outside of the boundary. An annual mass balance analysis will be included in each monitoring report to demonstrate that no leakage has occurred

Data / Parameter table 12.

Data / Parameter:	$\mathbf{Q_{i,s,y}}$
Data unit:	t/y
Description:	Quantity of input *i* in process *s* in year *y*
Source of data:	Direct continuous measurement on site
Measurement procedures (if any):	The input to every single process shall be measured right before consumption using calibrated scales/meters
Monitoring frequency:	Continuous

QA/QC procedures:	The data shall be aggregated in the project management system. The operator shall produce monthly monitoring reports. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per manufacturer's specifications, or at least once a year
Any comment:	This parameter is measured to ensure that produced co-products through the CRD process will not be consumed outside of the project boundary thus avoiding any leakage due to increase of fossil fuel consumption and/or replacement of renewable sources by co-products outside of the boundary. An annual mass balance analysis will be included in each monitoring report to demonstrate that no leakage has occurred

Data / Parameter table 13.

Data / Parameter:	$\mathbf{Q_{o,s,y}}$
Data unit:	t/y
Description:	Quantity of output *o* in the (sub-) process *s* in year *y*
Source of data:	Direct continuous measurement on site
Measurement procedures (if any):	The output from the (sub-) process *s* shall be measured using calibrated scales/meters
Monitoring frequency:	Continuous
QA/QC procedures:	The data shall be aggregated in the project management system. The operator shall produce monthly monitoring reports. The report shall be checked by the monitoring supervisor. The data monitored and required for verification and issuance shall be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later. The measuring equipment used for monitoring data shall be calibrated as per manufacturer's specifications, or at least once a year
Any comment:	This parameter is measured to ensure that produced co-products through the (sub-) process will not be consumed outside of the project boundary thus avoiding any leakage due to increase of fossil fuel consumption and/or replacement of renewable sources by co-products outside of the boundary. An annual mass balance analysis will be included in each monitoring report to demonstrate that no leakage has occurred

Data / Parameter table 14.

Data / Parameter:	$\mathbf{RATE_{compliance,y}}$
Data unit:	Fraction
Description:	Rate of compliance with a regulatory requirement to implement the CRD process 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. This parameter should be monitored annually only if during the validation of project activity law and/or regulation exists for CRD process

Data / Parameter table 15.

Data / Parameter:	SG_y
Data unit:	m^3/year
Description:	Volume of stack gas from CRD process in year *y*
Source of data:	Project participants
Measurement procedures (if any):	The stack gas flow rate is directly measured. Where there are multiple stacks of the same type, then it is sufficient to monitor one stack of each type
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:	-

Data / Parameter table 16.

Data / Parameter:	$C_{N2O,SG,y}$
Data unit:	t N_2O/Nm^3
Description:	Concentration of N_2O in stack gas from CRD process 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

Data / Parameter table 17.

Data / Parameter:	$C_{CH4,SG,y}$
Data unit:	T CH_4/Nm^3
Description:	Concentration of CH_4 in stack gas from CRD process 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

Data / Parameter table 18.

Data / Parameter:	$Q_{waste,y}$
Data unit:	T
Description:	Quantity of waste fed into CRD process 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 table 19.

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:	-

Data / Parameter table 20.

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:	-

Data / Parameter table 21.

Data / Parameter:	$\mathbf{EC_y}$
Data unit:	MWh
Description:	Electricity consumption of electricity associate with the CRD process which may be generated in an on-site fossil fuel fired power plant or from the grid as a result of the CRD process in year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	Sources of consumption shall include the operation of the CRD 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 CRD process
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 against invoices when available
Any comment:	This parameter is required for calculating project emissions from electricity consumption due to CRD process ($PE_{EC,y}$) using the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”. EC_y excludes consumption of any electricity generated by the project activity

Data / Parameter table 22.

Data / Parameter:	$\mathbf{EG_{s,y}}$
Data unit:	MWh
Description:	Electricity generated by the CRD process and exported to the grid or displacing fossil fuel fired power-only plant’s energy generation in year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	-
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
Any comment:	-

Data / Parameter table 23.

Data / Parameter:	$\mathbf{Q_{ww,y}}$
Data unit:	m^3
Description:	Amount of run-off wastewater 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 table 24.

Data / Parameter:	$\mathbf{P_{COD,y}}$
Data unit:	$tCOD/m^3$
Description:	COD of the run-off 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 run-off wastewater is treated aerobically, emissions are assumed to be zero, and hence this parameter does not need to be monitored

Data / Parameter table 25.

Data / Parameter:	$\mathbf{CT_y}$
Data unit:	Tons/truck
Description:	Average truck capacity for transportation
Source of data:	Project participant
Measurement procedures (if any):	On site measurement
Monitoring frequency:	Monthly and averaged annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 26.

Data / Parameter:	$\mathbf{DAF_w}$
Data unit:	km/truck
Description:	Average incremental distance for raw solid or product transportation
Source of data:	Project participant
Measurement procedures (if any):	On site measurement

Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 27.

Data / Parameter:	**Source of biomass residues**
Data unit:	Source
Description:	The biomass residues should not be obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical- degradation, etc.)
Source of data:	Project participant
Measurement procedures (if any):	Purchase orders or any other source for the biomass residue
Monitoring frequency:	Annually
QA/QC procedures:	-
Any comment:	-

Data / Parameter table 28.

Data / Parameter:	**Rate of compliance**
Data unit:	Fraction
Description:	Rate of compliance with a regulatory requirement to implement the CRD 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:	Use for confirming applicability of the methodology

- - - - -

Document information

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