PROGRAMME DESIGN DOCUMENT FORM FOR CDM PROGRAMMES OF ACTIVITIES (F-CDM-PoA-DD)
Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Title: City of Cape Town Treatment of Organic Waste Streams CDM Projects
Version: 01
Date of Completion: 06/07/2012

A.2. Purpose and general description of the PoA

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General operating and implementing framework of the PoA

The proposed PoA will incorporate measures to be installed at existing and proposed Wastewater Treatment Works (WWTWs) and Solid Waste Disposal Sites (SWDSs) within the Western Cape Province, South Africa. There are sixteen WWTWs that will contribute to prospective CDM programme activities (CPAs), and 7 or more Solid Waste Disposal Sites that will contribute to CPAs, as part of the programme of activities (PoA) detailed herein.

With respect to the WWTWs, the principal wastewater treatment process adopted throughout the geographical boundary is the activated sludge system. This system renders both primary sludge (PS) and waste activated sludge (WAS). This sludge is currently sent to landfill. The measures employed (as detailed in this PoA) will allow for anaerobic digestion (AD) of this sludge as well as the capture and flaring of the biogas produced. For those sites where it is considered beneficial to do so, biogas will be utilised further in a number of processes. Therefore, under this PoA, the biogas will be flared and/or used in one or more of the following ways:

- Process heat
- Space heating
- Water heating
- Electricity generation

With all related intermediate steps (e.g. burners and boilers).

The digestate from the AD process will typically be sent to landfill, but can be used has a number of more useful applications. Under this PoA, the digestate from the AD process will be landfilled and/or used in one of the following ways:

- Soil application (land farming)
- Composting (aerobic treatment)
- Generation of refuse derived fuel (RDF)
- Thermal treatment in a pelletisation plant

Organic waste streams from households, sectors of commerce and industries in food and agri-processing, as well as natural processes (e.g. beach kelp and marine carcasses) constitute organic waste streams currently sent to landfill. Some of these streams open the possibility of either direct anaerobic digestion,

anaerobic co-digestion with sludge from WWTWs, aerobic treatment via composting or refuse derived fuel (RDF).

As mentioned, both the sludge from the WWTW and the organic waste streams are currently disposed to landfill. Under the PoA, these streams will be treated alternatively, resulting in the controlled production of biogas which will be captured and either combusted or utilised, or aerobically treated via composting, or used in RDF. In some cases, the potential uses of the gas include the generation of heat for use in the sludge digestate drying process at WWTW, which will provide further benefit by offsetting the consumption of fossil fuels or electricity, which is otherwise needed as a fuel to produce heat for drying.

Policy/measure or stated goal that the PoA

The goal of the proposed PoA is to:

- Contribute to sustainable development within the Western Cape;
- Expand the use of renewable energy technologies in the Western Cape.
- Reduce uncontrolled emissions of GHG to atmosphere;
- Reduce the disposal of organic waste to landfill; and
- Optimise the recovery of materials from organic waste for beneficial use i.e. fertilizer.

In addition, the projects will increase the adoption of renewable energy and decrease reliance on fossil fuels by generating biogas for combustion to produce heat for use, in some cases in the treatment process. The biogas will be combusted in a flare at the project sites when the renewable energy is not recovered.

Contribution to Sustainable Development

The proposed PoA will contribute to sustainable development within the Western Cape by virtue of the following:

- contributing to national economic development;
- contributing to social development in South Africa;
- conforming with the National Environmental Management Act principles of sustainable development by:
    - avoiding disturbance of ecosystems and loss of biological diversity, or minimising and remediating them where they cannot be avoided;
    - avoiding pollution and degradation of the environment, or minimising and remediating them where they cannot be altogether avoided;
    - avoiding disturbance of landscapes and sites that constitute the nation's cultural heritage, or minimising and remediating them where they cannot be altogether avoided;
    - avoiding waste, or where it cannot be avoided altogether, minimising and reusing or recycling where possible or otherwise disposing of in a responsible manner;
    - ensuring that the development, use and exploitation of renewable resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;
    - applying a risk averse and cautious approach, which takes into account the limits of current knowledge and the consequences of decisions and actions;
    - ensuring that negative impacts on the environment and on people's environmental rights are anticipated and prevented, and where they cannot be altogether prevented that they are minimised and remedied;
- contributing significantly to the national capacity in the areas of green energy, carbon transactions and CDM registration and compliance; and
- streamlining the development of WWTWs and SWDSs development and sustainability projects.

Framework for the implementation of the proposed PoA

The PoA will be implemented and managed by the City of Cape Town.

Each CPA will be implemented within the proposed PoA in accordance with the eligibility criteria outlined in this PoA-DD.

In order to facilitate the development of the projects, the City of Cape Town will enter into contractual agreements with technical specialists, who will be responsible for the implementation, management and monitoring of the treatment systems at each site.

Confirmation that the PoA is a voluntary action by the coordinating/managing entity

It is confirmed that the PoA is a voluntary action by the coordinating/managing entity (CME) – the City of Cape Town. There are no mandatory requirements in South Africa regarding the treatment of waste water sludges using AD.

A.3. CMEs and participants of PoA

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The coordinating/managing entity (CME) of the PoA, and which will communicate with the Executive Board of the UNFCCC, will be the City of Cape Town.

The City of Cape Town will be contracting with project implementer to develop individual CPAs as part of the PoA. These appointments will be made following the completion of a thorough and transparent procurement process. Where such implementers are rendering services to the City of Cape Town, such services will be procured in a transparent and competitive manner according to South African law.

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of South Africa (host)	The City of Cape Town	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

Full contact information for the project participants is provided in Annex 1.

A.5. Physical/ Geographical boundary of the PoA

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Within the municipal boundary for the Western Cape, as currently defined by National Government (Act 27 of 1998).

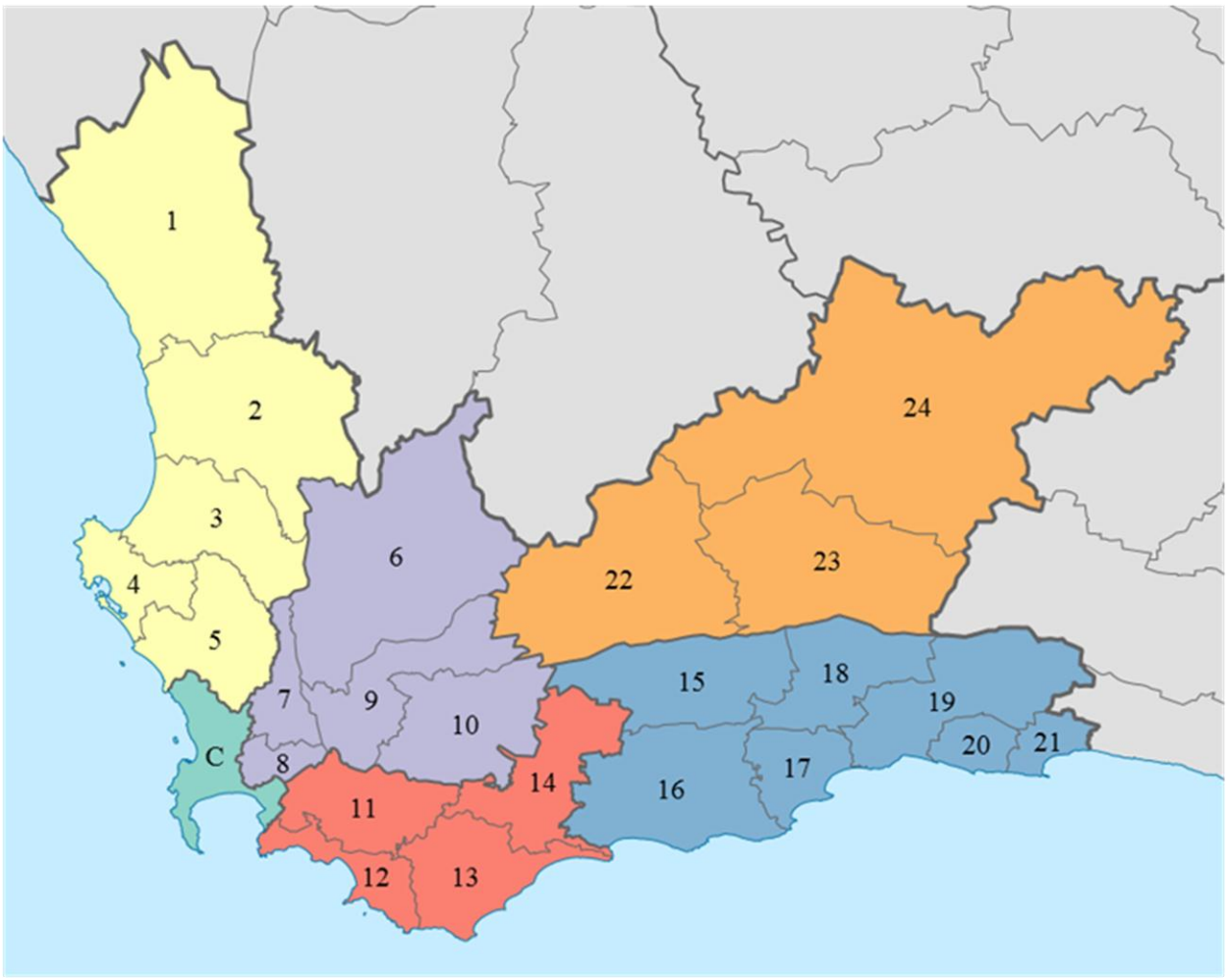

Figure 1: Municipal Boundary for the Western Cape

Key: District and metropolitan municipalities in the Western Cape

Map key	Name
6–10	Cape Winelands District Municipality
22–24	Central Karoo District Municipality
C	City of Cape Town Metropolitan Municipality
15–21	Eden District Municipality
11–14	Overberg District Municipality
1–5	West Coast District Municipality

A.6. Technologies/measures

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The project activity will apply the following methodology:

- AM0025 'Avoided emissions from organic waste through alternative waste treatment processes' Version 14.0.0 (all subsequent versions and related tools)

Prior to the implementation of the project activity, the pre-existing scenario (also the baseline scenario) is the disposal of WWTW sludge and organic waste streams to landfill with the concomitant uncontrolled release of landfill gas to the atmosphere.

The technology and measures to be employed by each CPA will be one or a combination of:

- Collection and combustion of biogas produced by the AD or organic waste streams
- Composting (aerobic treatment of organic waste)
- Production of RDF

In the case of the first option, a typical AD CPA will comprise of the construction and operation on a modern AD facility which will be used to treat the waste streams. The AD process will produce biogas in a controlled and contained manner. The biogas produced will be captured and combusted in a flare and/or used as a renewable energy in a thermal (e.g. utilisation of the biogas to provide process heat, space heating, water heating) or electricity generation. The digestate produced will be landfilled and/or used in soil application, aerobic treatment via composting, production of refuse derived fuel or thermally treated in a palletisation plant to produce fertiliser pellets.

In the case of composting itself, it will involve the aerobic treatment of these waste streams in a composting facility, with the resulting stream being used in a soil application or sent to landfill.

In the case of RDF, the fuel source will be used in a thermal and/or electricity generation process. In the case of RDF, the CPA will involve mechanical and/or thermal treatment of organic waste streams, also under controlled conditions (up to 300 degrees Celcius). The physical and chemical properties of the produced RDF will be homogenous and constant over time. The produced RDF will not be stored in a manner that may result in anaerobic conditions before its use.

The final residual wastes from AD and where applicable, the further digestate treatment process or the RDF process (if any) will be composted and used in soil application and/or delivered to landfill. The residual compost from the composting process will be used for soil application or sent to landfill.

A.7. Public funding of PoA

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The PoA will not receive public funding from sources other than the City of Cape Town.

SECTION B. Demonstration of additionality and development of eligibility criteria

B.1. Demonstration of additionality for PoA

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The Proposed PoA is additional because:

- The proposed PoA is a voluntary coordinated action by the City of Cape Town;
- There are no regulatory requirements in RSA regarding the AD of wastewater or other organic waste streams or the production of RDF. Therefore such projects would not be implemented in the absence of the PoA; and

- Prevailing practice in the Republic of South Africa is for wastewater sludges and organic waste streams to be deposited in landfills or dumpsites. This is the current situation in the Western Cape.

Emissions of GHG will therefore be reduced, by the implementation of the CPAs, to a level below those that would have occurred in the absence of the registered PoA. Furthermore, each CPA will be shown to be additional in the respective CPA-DD according to additionality requirements.

B.2. Eligibility criteria for inclusion of a CPA in the PoA

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In accordance with the requirements of the 'Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities' (Version 01.0), eligibility criteria to be considered prior to enrolling each CPA under the proposed PoA will include the following:

Eligibility Criterion				
Requirement	**Evaluation Criteria**	**Method of Evaluation**	**Yes/No**	**Comment/Source**
The geographical boundary	The geographical boundary shall be consistent with the PoA	The project shall be within the Western Cape Province's boundary as defined in law	Yes	See Section A.5
Time-induced boundary	Emission factors shall be calculated in accordance with regional criteria	The project shall specify the regional grid emission factor	Yes	See Section E.6.2 of the PoA
Avoidance of double counting of emission reductions	Emissions shall be accountable to the waste disposed	There shall be only one project in each CPA activity related to the disposal of waste. There may be more than one CPA on one particular site, but CERs for each CPA will be independent and counted separately with the avoidance of double counting.	Yes	The CPA is uniquely identified (e.g. by signage and site referencing) to avoid double counting. CPA 01 –Cape Flats Anaerobic Digestion Facility. See Section 1A.
Specification of technology measure	Anaerobic digestion and RDF technologies shall be in accordance with Section A.6 of this PoA	The project shall reference specifications for the design and operation of technologies used. The project shall reference compliance with testing/certification.	Yes Yes	See Section B.6 See Section B.&
Start date	The project start date shall be equal to or after the date of the PoA	The start-date of the CPA shall be the date of the first combustion of biogas, setting of compost or production of RDF (whichever is applicable)	Yes	See Section D.1 of the PoA and Section A.8.1 of the CPA

Compliance with applicability and requirements of single or multiple methodologies	Combinations of methodologies shall be approved by the UNFCCC	Combinations of methodologies shall comply with the UNFCCC CDM Methodology Booklet	Yes	Only one methodology is used. There is not combination of methodologies
	Compliance in accordance with AM0025	Compliance against the current version of AM0025 (Version 14 subsequent versions thereafter)	Yes	AM0025 Version 12 is applicable to 19th January 2013
		The inclusion of all appropriate formula and parameters for the calculation of emission reductions detailed in AM0025	Yes	See Section B.6.3
Additionality	Additionality shall be in accordance with EB65Annex 3 "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for Programme of Activities" and EB 65 Annex 21 Methodological tool "Tool for the demonstration and assessment of additionality"	The project would have not occurred due to at least one of the following: a) Investment barrier b) Technological barrier c) Prevailing practice d) Other barrier	Yes	See Section B.1
Local stakeholder consultation	Local stakeholder consultation shall have been undertaken	The project shall have undertaken local stakeholder consultation including: • Brief description how comments were invited and complied • Summary of comments received • Report on how due account was taken of any comments	Yes	See Section F

		received		
Environmental analysis	Environmental impact analysis including any transboundary impacts shall have been undertaken	Each CPA will have record of compliance with National Environmental Management Act for project activities	Yes	See Section E.3
Funding from Annex 1 parties	Diversion of official development assistance	The project does not result in a diversion of official development assistance	Yes	See Section B.5
Legal compliance	Compliance with South African environmental legislation, waste legislation and all other legislation related to the project activity (e.g. electricity generation).	The sites of the relevant CPA will have record of Authorization for waste treatment and/or disposal, and where applicable, electricity generation licence.	Yes	See Section E.3

B.3. Application of methodologies

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The PoA will apply the following approved baseline and monitoring methodology:

- AM0025 'Avoided emissions from organic waste through alternative waste treatment processes' Version 14.0.0 (all subsequent versions and related tools)

and all associated tools and guidance.

Each CPA implemented under this PoA will recover biogas via AD, aerobically treat the waste via composting, or produce RDF from wastewater treatment work sludge or organic waste streams from MSW in accordance with the technologies outlines in Section A.6.

Consideration of a sampling plan is not applicable. Each CPA within the PoA will be independently verified.

SECTION C. Management system

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Roles and Responsibilities

The proposed PoA involves a range of operational activities which will be required to successfully implement and manage each CPA. Whilst overall responsibility for the PoA will lie with the City of Cape Town (as the Coordinating/Managing Entity (CME)), technical support and management/monitoring input will be required for each CPA site from third parties (project implementers or their sub-contractors) within the PoA. Furthermore, technical support and management/monitoring input may be sourced from other authorities or entities engaged in waste management who may in the future contract with the City of Cape Town to include their activities in the PoA.

As the coordinating/managing entity, the City of Cape Town will be responsible for the overall management of the PoA, collation of data and preparation of Monitoring Reports for verification purposes, and providing the interface with the DOE and UNFCCC EB. In order to deliver each CPA in

the most effective manner, the CME may enter into contractual agreements with partner organisations and/or hire contractors and/or allow other waste operators to join the PoA subject to agreed terms and conditions. These respective entities be responsible for the implementation, management and monitoring of biogas flaring/utilisation, or the aerobic treatment via composting or process of RDF generation at each CPA site.

The CME, through a clearly defined and structured procurement process or by way of contractual agreements, will ensure that all partner organisations and sub-contractors will satisfy the required standards of the PoA, ensuring the quality of the waste treatment processes and the management procedures are maintained at a consistently high level.

Records and Document Control Process

For each CPA, there will be a detailed monitoring plan and system of electronic data management (which will be automated where practicable) in place prior to the commencement of the first crediting period. Each site will have its own installed data capture systems which will be accessible to the verifying Designated Operational Entity (DOE). All relevant monitoring data will be compiled in an electronic workbook, and will be supported by field notes/records and details of all instrument/equipment calibrations (including dates and copies of calibration certificates where available). All data collected on each site will be provided to the CME in an agreed format to provide a central point for the maintenance of all records applicable to the PoA. Detailed roles and responsibilities will be defined and agreed as part of the procurement process which the City of Cape Town will undertake to secure suitably qualified and experienced technical support, or alternatively by contractual agreement between the CME and other entities operating CPAs in the future. These will be defined in a PoA Management Manual which will be developed and adopted prior to the start of the first PoA crediting period.

The CME will be responsible for the regular collation, review and storage of monitoring data from each CPA.

Records of Arrangements for Training and Capacity Development

The PoA Management Manual will include the arrangements for recording the training and capacity development of all CME staff or staff of other entities operating CPAs. The contracts with third parties for the implementation of CPAs shall include the arrangements for recording the training and capacity development of all personnel working on the projects..

Technical Review of Inclusion

The PoA Management Manual will include procedures for the review of technology or measures to be employed by the CPA to ensure the CPA complies with this PoA.

Avoiding Double Counting

There will be no scope for double counting due to geographical dislocation and control by the CME or another local authority. In the case of those CPAs which fall within the geographical boundary of the City of Cape Town, these will be under control of the CME. Where CPAs are not being operated by the City of Cape Town, the CME shall require strict and verifiable adherence to these processes by the entities operating the relevant CPAs . Each CPA will be assigned a unique identification reference (including the site name, GPS co-ordinates and a numerical code) and data from each site will be managed and stored separately to facilitate the verification process. All waste will be weighed and recorded, and all quantities of biogas produced, compost processed or RDF generated will be recorded.

Measures for Continuous Improvement

The PoA Management Manual will include the arrangements for continuous improvement. All personnel shall have a Continuous Development Plan. The CME will arrange to undertake an annual assessment of each CPA and agree a plan for continuous improvement for the following year with the third party provider or shall require contractually that any operators of CPAs external to the City do so.

Subscription to the PoA

Each CPA will take place on WWTWs and/or SWDSs which are under the control of the City of Cape Town or another local authority within the Western Cape Province. The CME will be directly aware of any CPA to be included the PoA. Thus, there is no potential for the CME to be unaware of the inclusion of a CPA.

SECTION D. Duration of PoA

D.1. Start date of PoA

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The start date of the proposed PoA is 01/07/2013

D.2. Length of the PoA

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The length of the proposed PoA will be 28 years

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

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Environmental analysis will be undertaken at CPA level because primary environmental impact from each project is at the CPA level. Environmental data will not be captured unless the analysis is done at CPA level.

E.2. Analysis of the environmental impacts

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Not applicable – analysis of environmental impacts will be undertaken at CPA level

E.3. Environmental impact assessment

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South African laws/regulations require for each CPA a basic (environmental) assessment in accordance with the National Environmental Management Act 107 of 1998 (NEMA) and the related Environmental Impact Assessment (EIA) Regulations (GN R385).

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

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The local stakeholder consultation process will be performed at the CPA level in order to allow consideration of comments from the local communities in the vicinity of each CPA site.

F.2. Summary of comments received

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Not applicable – local stakeholder consultation will be carried out at CPA level

F.3. Report on consideration of comments received

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Not applicable – local stakeholder consultation will be carried out at CPA level

SECTION G. Approval and authorization

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No letters of approval or authorisation are available at the time of submitting the PoA-DD to the validating DOE.A letter of approval will be provided by the DNA for the registration of the PoA. Documents demonstrating authorization will be provided for each CPA.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

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This Component Project Activity (CPA) details the treatment of municipal sewage sludge and/or organic waste streams from MSW by way of anaerobic digestion and/or aerobic treatment via composting and/or maceration and dehydration to generate refuse derived fuel at Site X. In the case of WWTW sludge, this will be sent to Site X for further treatment via AD. In the case of SWDS, organic waste streams will be sent to Site X for treatment via AD, either alone or co-digested with WWTW sludge, or alternatively, used in the production of RDF at Site X. There is a further option to treat either or both waste streams aerobically via composting at Site X

Certified Emission Reductions (CERs) will be claimed for the alternative treatment of the abovementioned waste streams using AM0025.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

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The proposed CPA uses the approved methodology AM0025 'Avoided emissions from organic waste through alternative waste treatment processes' Version 14.0.0.

Where applicable, the CPA will also use the following tools:

- "Tool for the demonstration and assessment of additionality" (Version 06.0.0, EB 65 Annex 21);
- "Emissions from solid waste disposal sites" (Version 06.0.1, EB 66 Annex 46);
- "Tool to determine project emissions from flaring gases containing methane" (EB 28 Annex 13);
- "Tool to calculate the emission factor for an electricity system" (Version 02.2.1, EB 63 Annex 19);
- "Project and leakage emissions from composting" (Version 01.0.0, EB 65 Annex 09)

Subsequent versions will be used where the above are superseded.

B.2. Application of methodology(ies)

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The methodology AM0025 "Avoided Emissions from organic waste through alternative waste treatment processes" (Version 14.0.0) is applicable to each CPA. The justification for the choice of the methodology to AD and/or flaring and/or electricity generation and/or end use is as follows:

Justification of choice of Methodology	
Methodology Requirement	**Applicability Criteria**
The project activity involves one or a combination of the following waste treatment options for the fresh waste that in a given year would have otherwise been disposed of in a landfill: (a) A composting process in aerobic conditions; (b) Gasification to produce syngas and its use; (c) Anaerobic digestion with biogas collection and flaring and/or its use. The anaerobic digester processes only the waste for which emission reductions are claimed in this methodology. If the biogas is processed and upgraded to the quality of natural gas and it is distributed as energy via natural gas distribution grid, project activities may use approved methodology AM0053 in conjunction with this methodology. In such cases the baseline scenario identification procedure and additionality assessment shall be undertaken for the combination of the two components of the project activity i.e. biomethane emission avoidance and displacement of natural gas; (d) Mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and its use. The thermal treatment process (dehydration) occurs under controlled conditions (up to 300 degrees Celsius). In case of thermal treatment process, the process shall generate a stabilized biomass that would be used as fuel or raw material in other industrial process. The physical and chemical properties of the produced RDF/SB shall be homogenous and constant over time; (e) Incineration of fresh waste for energy generation, electricity and/or heat. The thermal energy generated is either consumed on-site and/or exported to a nearby facility. Electricity generated is either consumed on-site, exported to the grid or exported to a nearby facility. The incinerator is rotating fluidized bed or circulating fluidized bed or hearth or grate type.	The CPA will involve one or a combination of either: (a) A composting process in aerobic conditions; (c) Anaerobic digestion with biogas collection and flaring and/or its use; (d) Mechanical/thermal treatment process to produce refuse derived fuel. Further criteria are noted next to the relevant sections. Where applicable, in the AD process, the anaerobic digester will only the waste for which emissions reductions are claimed. If the biogas is upgraded and connected to a grid, approved methodology AM0053 will be used in conjunction with this methodology, and the baseline scenario identification and additionality assessment shall be undertaken for the combination of the two components of the project activity. Where applicable, in the case of RDF, the thermal treatment process will occur under controlled conditions (up to 300 degrees Celcius). The resulting product shall generate a fuel that would be used in other in other industrial processes. The physical and chemical properties of the produced RDF shall be homogenous and constant over time

In case of anaerobic digestion, gasification or RDF processing of waste, the residual waste from these processes is aerobically composted and/or delivered to a landfill	In the case of AD, the residual waste will be delivered to landfill
In case of composting, the produced compost is either used as soil conditioner or disposed of in landfills	In the case of composting, the produced compost will be landfilled where is not used in a soil application.
In case of RDF/stabilized biomass processing, the produced RDF/stabilized biomass should not be stored in a manner that may result in anaerobic conditions before its use	In the case of RDF, the product will not be stored so that anaerobic degradation may occur.
If RDF/SB is disposed of in a landfill, project proponent shall provide degradability analysis on an annual basis to demonstrate that the methane generation, in the life-cycle of the SB is below 1% of related emissions. It has to be demonstrated regularly that the characteristics of the produced RDF/SB should not allow for re-absorption of moisture of more than 3%. Otherwise, monitoring the fate of the produced RDF/SB is necessary to ensure that it is not subject to anaerobic conditions in its lifecycle	This is not applicable. RDF will only be produced where it can be utilised for energy recovery.
In the case of incineration of the waste, the waste should not be stored longer than 10 days. The waste should not be stored in conditions that would lead to anaerobic decomposition and, hence, generation of CH_4	This is not applicable. Incineration technology is not part of this PoA
The proportions and characteristics of different types of organic waste processed in the project activity can be determined, in order to apply a multiphase landfill gas generation model to estimate the quantity of landfill gas that would have been generated in the absence of the project activity	The proportions and characteristics of the waste will be measured and quantified.
The project activity may include electricity generation and/or thermal energy generation from the biogas, syngas captured, RDF/stabilized biomass produced, combustion heat generated in the incineration process, respectively, from the anaerobic digester, the gasifier, RDF/stabilized biomass combustor, and waste incinerator. The electricity can be exported to the grid and/or used internally at the project site. In the case of RDF/SB produced, the emission reductions can be claimed only for the cases where the RDF/SB used for electricity and/or thermal energy generation can be monitored	Certain CPAs may include electricity generation from the combustion of the biogas produced or burning of the RDF generated. Where RDF is the fuel source, emissions reduction will be claimed only for the cases where the RDF used can be monitored.
Waste handling in the baseline scenario shows a continuation of current practice of disposing the waste in a landfill despite environmental regulation that mandates the treatment of the	The baseline scenario for all CPAs will be the continuation of current practice of disposing of the waste to landfill. There are no environmental regulations mandating any of the project activity

waste, if any, using any of the project activity treatment options mentioned above	treatment options.
The compliance rate of the environmental regulations during (part of) the crediting period is below 50%; if monitored compliance with the MSW rules exceeds 50%, the project activity shall receive no further credit, since the assumption that the policy is not enforced is no longer tenable	The compliance rate will be below 50%. In the event that compliance exceeds 50%, the CME will inform the DOE to stop crediting. This may not be applicable in the RSA.
Local regulations do not constrain the establishment of RDF production plants/thermal treatment plants nor the use of RDF/stabilized biomass as fuel or raw material	With respect to RDF, it is confirmed that local regulations do not constrain the establishment of RDF plants nor the use of stabilised biomass as fuel or raw material
In case of RDF/stabilized biomass production, project proponent shall provide evidences that no GHG emissions occur, other than biogenic CO_2, due to chemical reactions during the thermal treatment process (such as Chimney Gas Analysis report)	With regard to RDF, flue and stack gas emissions will be monitored and recorded as part of the CPA to ensure that there are no GHG emissions other than biogenic carbon dioxide.
The project activity does not involve thermal treatment process of neither industrial nor hospital waste	It is confirmed that no CPA will encompass thermal treatment of industrial or hospital wastes.
In case of waste incineration, if auxiliary fossil fuel is added into the incinerator, the fraction of energy generated by auxiliary fossil fuel is no more than 50% of the total energy generated in the incinerator	Not applicable. This PoA does not have CPAs which encompass waste incineration.
This methodology is not applicable to project activities that involve capture and flaring of methane from existing waste in the landfill. This should be treated as a separate project activity due to the difference in waste characteristics of existing and fresh waste, which may have an implication on the baseline scenario determination	This PoA does not include the capture and flaring of landfill gas. Each CPA in this PoA will deal specifically with the treatment of fresh waste.

The associated tools with this methodology are qualified with respect to applicability as follows:

Applicability of Methodological tool "Tool for the demonstration and assessment of additionality" (Version 06.0.0, EB 65 Annex 21)

The tool is applicable to all methodologies and must qualify the project as additional against one or more of the following barriers:

- Investment Barrier
- Technological Barriers
- Common Practice
- Other Barriers

There is a note in the methodology that, in the case of RDF/stabilized biomass production, a key uncertainty for additionality is the price RDF/stabilized biomass could attain in the region that RDF/stabilized biomass will be produced. The RDF/stabilized biomass price will be directly affected by

its demand and the availability of other substitute products. Therefore, to address this, an evaluation of the stabilized biomass price will be carried out at the end of each crediting period (if the renewable crediting period is to be selected).

Applicability of Methodological tool ""Emissions from solid waste disposal sites" (Version 06.0.1, EB 66 Annex 46)

The tool is applicable to the POA under Application B: the CDM project activity avoids or involves the disposal of waste at a SWDS. This tool will be used where the CPA involves the treatment of MSW with an alternative option, in this case, anaerobic digestion and thus it is not disposed of at a SWDS. The tool will be applied separately for each type of waste, e.g. WWTW sludge, or organic waste streams from MSW.

Applicability of "Tool to determine project emissions from flaring gases containing methane" (EB 28 Annex 13)

This tool is applicable under the PoA if the residual gas stream to be flared contains no other combustible gasses than methane, carbon dioxide and hydrogen and that the residual gas streams shall be obtained from the decomposition of organic materials, through landfills, bio-digesters or anaerobic lagoons, among others) or from gases vented in coal mines (coal mine methane and coal be methane). Under this PoA, CPAs which involve the AD or WWTW sludge and/or OFMSW streams will employ this tool.

Applicability of "Tool to calculate the emission factor for an electricity system" (Version 02.2.1, EB 63 Annex 19)

The tool is applicable to the estimation of the Operating Margin (OM), Build Margin (BM) and/or Combined Margin (CM) emission factor when calculating baseline emissions for a project activity that substitutes grid electricity, i.e. where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects). This will be the case for CPAs which use biogas or RDF to generate electricity and therefore the tool will be applicable in those cases.

Applicability of "Project and leakage emissions from composting" (Version 01.0.0, EB 65 Annex 09)

This tool is applicable to calculate project and/or leakage emissions from composting and co-composting. Typical use is in the composting of MSW, agricultural wastes and digestate. The tool accounts for methane and N2O emission from composting, as well as the CO2 emissions from consumption of fossil fuels and electricity associated with composting and the CH4 emission from run-off wastewater associated with composting. Leakage in the form of CH4 is accounted for from the anaerobic decay of the residual organic content of compost disposed of in a landfill site.

B.3. Sources and GHGs

	Source	**Gas**		**Justification / Explanation**
Baseline	Emissions from decomposition of waste at the	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

	Source	Gas		Justification / Explanation
	landfill site	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted[a]
	Emissions from electricity consumption	CO_2	Included	Electricity may be consumed from the grid or generated onsite/offsite in the baseline scenario
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Emissions from thermal energy generation	CO_2	Included	If thermal energy generation is included in the project activity
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Included	May be an important emission source. It includes vehicles used on-site, heat generation for mechanical/thermal treatment process, start-up of the gasifier, auxiliary fossil fuels needed to be added into incinerator, etc
		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 is generated from collected biogas/syngas, these emissions are not accounted for. CO_2 emissions from fossil based waste from RDF/stabilized biomass combustion to generate electricity to be used on-site are accounted for
		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 thermal energy generation	CO_2	Included	If thermal energy generation is included in the project activity
		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
	Direct emissions from the waste treatment processes.	N_2O	Included	May be an important emission source for composting activities. N_2O can be emitted from incineration, Syngas[a] produced, anaerobic digestion of waste and RDF/stabilized biomass 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[b]

[a] Project proponents wishing to neglect these emission sources shall follow the clarification in Annex 2 of EB 22 report which states that "magnitude of emission sources omitted in the calculation of project emissions and leakage effects (if positive) should be equal to or less than the magnitude of emission sources omitted in the calculation of baseline emissions".

	Source	Gas		Justification / Explanation
		CH_4	Included	The composting process may not be complete and result in anaerobic decay. 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 stacks [a] from incineration, the gasification process and the RDF/stabilized biomass combustion
	Emissions from waste water treatment	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted[b]
		CH_4	Included	The wastewater treatment should not result in CH_4 emissions, such as in anaerobic treatment; otherwise accounting for these emissions should be done
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small

B.4. Description of baseline scenario

>>

According to the methodological "Tool for the demonstration and assessment of additionality", (Ver 06.0.0, EB 65 Annex 21), the baseline is therefore described as:

With respect to disposal:

M3: Disposal on a landfill without the capture of landfill gas. Landfill gas produced by the disposal of the organic waste to landfill will not be included in the separate Landfill Gas PoA and will be separately accounted for.

With respect to power generation:

P4: Existing or Construction of a new on-site or off-site fossil fuel fired captive power plant; and

P6: Existing and/or new grid-connected power plants

With respect to heat generation:

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

This combination is qualified as the most plausible baseline scenario and described as Scenario 1 in Table 1 in EB 65 Annex 21, which describes the baseline as: The disposal of the waste in a landfill site without capturing landfill gas or the disposal of the waste in a landfill site where the landfill gas is partly captured and subsequently being flared. The electricity is obtained from an existing/new fossil based captive power plant or from the grid and heat from an existing/new fossil fuel based boiler.

B.5. Demonstration of eligibility for a generic CPA

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Each CPA shall be qualified for inclusion under the PoA against the following checklist.

Eligibility Criterion		
Requirement	**Evaluation Criteria**	**Method of Evaluation**
The geographical boundary	The geographical boundary shall be consistent with the PoA	Check that the project falls within the boundary of the Western Cape

[b] 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.

Avoidance of double counting of emission reductions	Emissions shall be accountable to the waste disposed	Monitor the quantities of waste disposed
Specification of technology measure	Anaerobic digestion and RDF technologies shall be in accordance with Section A.6 of this PoA	Assess equipment in monitoring plan to ensure that they are compliant with Section A.6 of the PoA
Start date	The project start date shall be equal to or after the date of the PoA	The start-date of the CPA shall be the date of the first combustion of biogas or burning of RDF
Compliance with applicability and requirements of single or multiple methodologies	Combinations of methodologies shall be approved by the UNFCCC Compliance in accordance with AM0025	Combinations of methodologies shall comply with the UNFCCC CDM Methodology Booklet Compliance will be checked against the current version of AM0025 (Version 14 subsequent versions thereafter) The inclusion of all appropriate formula and parameters for the calculation of emission reductions detailed in AM0025
Additionality	Additionality shall be in accordance with EB65Annex 3 "Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for Programme of Activities" and EB 65 Annex 21 Methodological tool "Tool for the demonstration and assessment of additionality"	Financial calculations will show that the project would not occur due to the investment barrier. Furthermore, prevailing practice warrants this as a voluntary action.
Local stakeholder consultation	Local stakeholder consultation shall have been undertaken	For each CPA, a local stakeholder consultation will be advertised, documented and minuted. All comments pertaining to CDM will be recorded.
Environmental analysis	Environmental impact analysis including any trans-boundary impacts shall have been undertaken	Each CPA will have record of compliance with National Environmental Management Act for project activities. This can be made available by the CME
Funding from Annex 1 parties	Diversion of official development assistance	The project will not be funded by an Annex 1 country
Legal compliance	Compliance with South African waste legislation	Records of authorisation for the site of each CPA will be made available by the CME

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

>>

This methodology addresses project activities where fresh waste (i.e. the organic matter present in new domestic, commercial waste, organic industrial waste[1] and municipal solid waste), originally intended for landfilling, is treated either through one or a combination of the following process: composting, gasification, anaerobic digestion, RDF processing/thermal treatment without incineration, and with incineration. The CPA avoids methane emissions by diverting organic waste from disposal at a landfill, where methane emissions are caused by anaerobic processes, and by displacing electricity/ thermal energy through the utilization of biogas, syngas captured, RDF/stabilized biomass produced from the waste, combustion heat generated in the incineration process. By treating the fresh waste through alternative treatment options these methane emissions are avoided from the landfill. The GHGs involved in the baseline and project activity are CO_2, CH_4 and N_2O.

Methodological choices have been outlined in Sections B.1 and B.2.

Emissions reductions calculations are shown in section B.6.3

B.6.2. Data and parameters that are to be reported ex-ante

For the calculation of Project Activity Emissions

Electricity Consumption

Data / Parameter	$EG_{PJ,FF,y}$
Unit	MWh
Description	The amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid as a result of the project activity, measured using an electricity meter
Source of data	Measured
Value(s) applied	Xx
Choice of data or Measurement methods and procedures	
Purpose of data	Electricity consumption in project activity
Additional comment	

[1] This may include organic industrial sludge e.g. organic sludge generated from the effluent treatment plant of a pulp and paper manufacturing process.

Data / Parameter	CEF_{elec}
Unit	tCO_2/MWh
Description	Is the carbon emissions factor for electricity generation in the project activity
Source of data	Eskom Annual Report / CDM Methodology
Value(s) applied	0.92
Choice of data or Measurement methods and procedures	
Purpose of data	Electricity consumption in project activity
Additional comment	This is a standard value which is published by Eskom. The latest annual report estimates a value of 0.99 kg. CO_2/kWh. However, SLR calculated a value of 0.923654 for the Eskom Grid, as per the standard CDM methodology

Fuel Use On-Site

Data / Parameter	$F_{cons,y}$
Unit	l or kg
Description	the CO_2 emissions due to on-site fuel combustion in year *y*
Source of data	Xx
Value(s) applied	Xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of on-site fuel consumption
Additional comment	

Data / Parameter	NCV_{fuel}
Unit	MJ/l or MJ/kg
Description	the net caloric value of the fuel
Source of data	Xx
Value(s) applied	Xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of on-site fuel consumption
Additional comment	

Data / Parameter	EF_{fuel}
Unit	tCO_2/MJ
Description	the CO_2 emissions factor of the fuel
Source of data	Xx
Value(s) applied	Xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of on-site fuel consumption
Additional comment	

Emissions from composting are not applicable

Emissions from Anaerobic Digestion

Emissions from physical leakage of the anaerobic digester

Data / Parameter	$PE_{a,l,y}$
Unit	(fraction)
Description	the physical leakage factor from a digester
Source of data	IPCC default value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of physical leakage from an anaerobic digester
Additional comment	

Data / Parameter	$M_{a,y}$
Unit	tCO_2e
Description	the total quantity of methane produced by the digester in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of physical leakage from an anaerobic digester
Additional comment	

Emissions from anaerobic digestion stacks

Data / Parameter	$SG_{a,y}$
Unit	m^3/yr
Description	the total volume of stack gas from the anaerobic digestion in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from anaerobic digestion stacks
Additional comment	

Data / Parameter	$MC_{N2O,a,y}$
Unit	tN_2O/m^3
Description	the monitored content of nitrous oxide in the stack gas from anaerobic digestion in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from anaerobic digestion stacks
Additional comment	

Data / Parameter	GWP_{N2O}
Unit	tCO_2e/tN_2O
Description	the Global Warming Potential of nitrous oxide
Source of data	IPCC Default Value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from anaerobic digestion stacks
Additional comment	

Data / Parameter	$MC_{CH4,a,y}$
Unit	tCH_4/m^3
Description	Is the monitored content of methane in the stack gas from anaerobic digestion in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from anaerobic digestion stacks
Additional comment	

Data / Parameter	GWP_{CH4}
Unit	tCO_2e /tCH_4
Description	the Global Warming Potential of methane
Source of data	IPCC Default Value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from anaerobic digestion stacks
Additional comment	

Emissions from combustion of RDF

Data / Parameter	$SG_{g/r/i,y}$
Unit	m3/yr
Description	the total volume of stack gas from gasification, waste incineration or RDF/stabilized biomass combustion in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emission from combustion of RDF
Additional comment	

Emissions from Wastewater Treatment Works

Data / Parameter	$Q_{COD,y}$
Unit	m3/yr
Description	Amount of wastewater treated anaerobically or released untreated from the project activity in year *y*, which shall be measured monthly and aggregately annually
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from WWTW
Additional comment	

Data / Parameter	$P_{COD,y}$
Unit	$tCOD/m^3$
Description	Chemical Oxygen Demand (COD) of wastewater, which will be measured monthly and averaged annually
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from WWTW
Additional comment	

Data / Parameter	B_0
Unit	$tCH_4/tCOD$
Description	Maximum methane producing capacity
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from WWTW
Additional comment	

Data / Parameter	MCF_p
Unit	(fraction)
Description	Methane conversion factor
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from WWTW
Additional comment	Preferably local specific value should be used. In absence of local values, MCF_p default values can be obtained from table 6.3, chapter 6, volume 4 from IPCC 2006 guidelines

Emissions from the thermal energy generation/electricity generation

Data / Parameter	$F_{co\text{-}firing,y}$
Unit	l or kg
Description	Is the fossil fuel consumption for thermal energy generation/electricity in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from thermal energy / electricity generation
Additional comment	

Data / Parameter	$NCV_{co\text{-}firing}$
Unit	MJ/l or MJ/kg
Description	the net caloric value of the fossil fuel used for thermal energy
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from thermal energy / electricity generation
Additional comment	

Emissions from the thermal energy generation/electricity generation

Data / Parameter	$EF_{co\text{-}firing}$
Unit	tCO_2/MJ
Description	the CO_2 emissions factor of the fossil fuel used for thermal energy generation/electricity
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions from thermal energy / electricity generation
Additional comment	

Emissions from composting

Data / Parameter	Q_y
Unit	tonnes
Description	The quantity of waste composted every year
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	$SEC_{comp,default}$
Unit	MWh/tonne
Description	Electricity consumed per tonne of compost
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	$EF_{FC,default}$
Unit	tCO_2/tonne
Description	Default emission factor for fuels consumed by the composting activity per tonne of waste
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	$EF_{CH4,y}$
Unit	tCH_4/tonne
Description	Emission factor of methane per tonne of waste composted valid for year y
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	GWP_{CH4}
Unit	tCO_2e/tCH_4
Description	Global Warming Potential of CH4
Source of data	Xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	$EF_{N2O,y}$
Unit	tN_2O,tonne
Description	Emission facto of nitrous oxide per tonne of waste valid for year y
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Data / Parameter	$Q_{COD,y}$
Unit	tCOD/yr
Description	Quantity of the COD of the run-off wastewater from the co-composting installation of year y (tCOD/yr)
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of emissions composting
Additional comment	

Baseline emissions

Adjustment Factor

Data / Parameter	AF
Unit	%
Description	Adjustment Factor for MB_y
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Rate of Compliance

Data / Parameter	$RATE^{Compliance}_{y}$
Unit	-
Description	the state-level compliance rate of the MSW Management Rules in that year *y*. The compliance rate shall be lower than 50%; if it exceeds 50% the project activity shall receive no further credit
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Methane generation from the landfill in the absence of the project activity

Data / Parameter	$BE_{CH4,SWDS,y}$
Unit	tCO_2e
Description	Is the methane generation from the landfill in the absence of the project activity at year *y* that is methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site during the period from the start of the project activity to the end of the year *y* as calculated using Application B in the methodological tool "Emissions from solid waste disposal sites". The tool estimates methane generation adjusted for, using adjustment factor (f_y), any landfill gas in the baseline that would have been captured and destroyed to comply with relevant regulations or contractual requirements, or to address safety and odour concerns. As this is already accounted for in equation 20, in this methodology, "f_y" in the tool shall be assigned a value 0
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Data / Parameter	$A_{j,x}$
Unit	tonnes/year
Description	the amount of organic waste type *j* prevented from disposal in the landfill in the year *x* , this is the value to be used for variable $W_{j,x}$ in the methodological tool "Emissions from solid waste disposal sites"
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	

Baseline Emissions from generation of electricity

Data / Parameter	$EG_{d,y}$
Unit	MWh
Description	the amount of electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity and exported to the grid or displacing onsite/offsite fossil fuel captive power plant during the year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions form electricity generation
Additional comment	

Data / Parameter	CEF_d
Unit	tCO_2/MWh
Description	the carbon emissions factor for the displaced electricity source in the project scenario
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions form electricity generation
Additional comment	

Baseline Emission from electricity and heat cogeneration

Data / Parameter	$EF_{fuel,c}$
Unit	tCO_2/TJ
Description	the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline cogeneration plant in, obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC 2006 default emission factors
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions from electricity and heat cogeneration
Additional comment	

Data / Parameter	Qy
Unit	TJ
Description	The quantity of thermal energy produced utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing thermal energy from cogeneration during the year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions from electricity and heat cogeneration
Additional comment	

Data / Parameter	$EG_{d,y}$
Unit	GWH
Description	the amount of electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing onsite/offsite cogeneration plant during the year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions from electricity and heat cogeneration
Additional comment	

Data / Parameter	η_{Cogen}
Unit	-
Description	efficiency of cogeneration plant that would have been used in the absence of the project activity
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions from electricity and heat cogeneration
Additional comment	

Leakage Emissions

Leakage from Transportation

Data / Parameter	$NO_{vehicles,i,y}$
Unit	-
Description	the number of vehicles for transport with similar loading capacity
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Data / Parameter	$DT_{i,y}$
Unit	km
Description	the average additional distance travelled by vehicle type i compared to baseline in year *y*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Data / Parameter	$VF_{cons,i}$
Unit	l/km
Description	the vehicle fuel consumption in litres per kilometre for vehicle type *i*
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Data / Parameter	NCV_{fuel}
Unit	MJ/Kg or other unit
Description	the Calorific value of the fuel
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Data / Parameter	D_{fuel}
Unit	kg/l
Description	the fuel density (if necessary)
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Data / Parameter	EF_{fuel}
Unit	tCO_2/MJ
Description	Emission factor of the fuel
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Leakage emissions from residual waste from anaerobic digester and processing/combustion of RDF

Data / Parameter	$A_{ci,x}$
Unit	kg
Description	Weight of each of the waste types *i* in year *x* should be estimated
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Leakage from off-site emissions from end-use of the stabilised biomass

Data / Parameter	R
Unit	t/yr
Description	the weight of RDF/stabilized biomass sold offsite for which no sale invoices can be provided
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of Leakage Emissions
Additional comment	

Leakage emissions from composting

Data / Parameter	$LE_{comp,y}$
Unit	tCO_2e/yr
Description	
Source of data	xx
Value(s) applied	xx
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of leakage emissions from composting
Additional comment	The parameter $LE_{COMP,y}$, corresponds to the value of $LE_{SWDS,y}$ calculated from the methodological tool "Emission from solid waste disposal sites"

B.6.3. Ex-ante calculations of emission reductions

>>

Project Activity

The project emissions in year *y* are:

$$PE_y = PE_{elec,y} + PE_{fuel,\ on\text{-}site,y} + PE_{c,y} + PE_{a,y} + PE_{g,y} + PE_{r,y} + PE_{i,y} + PE_{w,y} + PE_{co\text{-}firing,y} \quad \textbf{(1)}$$

Where:

PE_y	=	Is the project emissions during the year *y* (tCO_2e)
$PE_{elec,y}$	=	Is the emissions from electricity consumption on-site due to the project activity in year *y* (tCO_2e)
$PE_{fuel,\ on\text{-}site,y}$	=	Is the emissions on-site due to fuel consumption on-site in year *y* (tCO_2e)
$PE_{c,y}$	=	Is the emissions from composting in year *y* (tCO_2e)
$PE_{a,y}$	=	Is the emissions from the anaerobic digestion process in year *y* (tCO_2e)
$PE_{g,y}$	=	Is the emissions from the gasification process in year *y* (tCO_2e)
$PE_{r,y}$	=	Is the emissions from the combustion of RDF/stabilized biomass in year *y* (tCO_2e)
$PE_{i,y}$	=	Is the emissions from waste incineration in year *y* (tCO_2e)
$PE_{w,y}$	=	Is the emissions from wastewater treatment in year *y* (tCO_2e)
$PE_{co\text{-}firing,y}$	=	Is the emissions from thermal energy generation/electricity generation from on-site fossil fuel consumption during co-firing in year *y* (tCO_2e)

Emissions from electricity use on site ($PE_{elec,y}$)

Where the project activity involves electricity consumption, CO_2 emissions are calculated as follows:

$$PE_{elec,y} = EG_{PJ,FF,y} * CEF_{elec} \quad \textbf{(2)}$$

Where:

$EG_{PJ,FF,y}$	=	Is the amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid as a result of the project activity, measured using an electricity meter (MWh)
CEF_{elec}	=	Is the carbon emissions factor for electricity generation in the project activity (tCO_2/MWh)

In cases where electricity is generated in an on-site fossil fuel fired power plant, project participants should use, as CEF_{elec}, the default emission factor for a diesel generator with a capacity of more than 200 kW for project activities (0.8 tCO_2/MWh, in the simplified baseline and monitoring methodologies for selected CDM project activity categories).

In cases where electricity is purchased from the grid, the emission factor CEF_{elec} should be calculated according to the "Tool to calculate the emission factor for an electricity system".

Note: Project emissions from electricity consumption do not need to be calculated in case this electricity is generated by the project activity from biogas, or syngas. In case of electricity generation from RDF/stabilized biomass or incineration, project emissions are estimated as per equations 12 and 13 or (14).

Furthermore, electricity consumption for composting should not be included in $EG_{PJ,FF,y}$, as this emission source is accounted for in the parameter $PE_{c,y}$.

If auxiliary fossil fuels need to be added into incinerator, emissions from its use shall be estimated by using equation 3 below.

Emissions from fuel use on-site ($PE_{fuel, on\text{-}site,y}$)

Project participants shall account for CO_2 emissions from any on-site fuel combustion (other than electricity generation, e.g. vehicles used on-site, heat generation, for starting the gasifier, auxiliary fossil fuels need to be added into incinerator, heat generation for mechanical/thermal treatment process, etc.). Emissions are calculated from the quantity of fuel used and the specific CO_2-emission factor of the fuel, as follows:

$$PE_{fuel, on\text{-}site,y} = F_{cons,y} * NCV_{fuel} * EF_{fuel} \quad \textbf{(3)}$$

Where:

$PE_{fuel, on\text{-}site,y}$	=	Is the CO_2 emissions due to on-site fuel combustion in year *y* (tCO_2)
$F_{cons,y}$	=	Is the fuel consumption on site in year *y* (l or kg)
NCV_{fuel}	=	Is the net caloric value of the fuel (MJ/l or MJ/kg)
EF_{fuel}	=	Is the CO_2 emissions factor of the fuel (tCO_2/MJ)

Local values should be preferred as default values for the net calorific values and CO_2 emission factors. If local values are not available, project participants may use IPCC default values for the net calorific values and CO_2 emission factors.

Note that fuel consumption for the purpose of composting should not be included in $F_{cons,y}$, as this emission sources is accounted for in the parameter $PE_{c,y}$.

Emissions from composting ($PE_{c,y}$)

Project emissions associated with composting ($PE_{c,y}$) are calculated according to the methodological tool to estimate "Project and leakage emissions from composting". $PE_{c,y}$ is equivalent to parameter $PE_{COMP,y}$ in the tool.

Emissions from anaerobic digestion ($PE_{a,y}$)

$$PE_{a,y} = PE_{a,l,y} + PE_{a,s,y} \quad \textbf{(4)}$$

Where:

$PE_{a,l,y}$	=	Is the CH_4 leakage emissions from the anaerobic digesters in year *y* (tCO_2e)
$PE_{a,s,y}$	=	Is the total emissions of N_2O and CH_4 from stacks of the anaerobic digestion process in year *y* (tCO_2e)

CH_4 Emissions from physical leakage from the anaerobic digester ($PE_{a,l,y}$)

A potential source of project emissions is the physical leakage of CH_4 from the anaerobic digester. Three options are provided for quantifying these emissions, in the following preferential order:

Option 1: Monitoring the actual quantity of the gas leakage;

1. Option 2: Applying an appropriate IPCC physical leakage default factor, justifying the selection:

$$PE_{a,l,y} = P_l * M_{a,y} \quad \textbf{(5)}$$

Where:

$PE_{a,l,y}$	=	Is the leakage of methane emissions from the anaerobic digester in year *y* (tCO_2e)
P_l	=	Is the physical leakage factor from a digester (fraction)
$M_{a,y}$	=	Is the total quantity of methane produced by the digester in year *y* (tCO_2e)

Option 3: Applying a physical leakage factor of zero where advanced technology used by the project activity prevents any physical leakage. In such cases, the project proponent must provide the DOE with the details of the technology to prove that the zero leakage factor is justified.

Emissions from anaerobic digestion stacks ($PE_{a,s,y}$)

Biogas produced from the anaerobic digestion process may be either flared or used for energy generation. The final stack emissions (either from flaring or energy generation process) are monitored from the final stack and estimated as follows:

$$PE_{a,s,y} = SG_{a,y} * MC_{N2O,a,y} * GWP_{N2O} + SG_{a,y} * MC_{CH4,a,y} * GWP_{CH4} \quad \textbf{(6)}$$

Where:

$PE_{a,s,y}$	=	Is the total emissions of N_2O and CH_4 from stacks of the anaerobic digestion process in year *y* (tCO_2e)
$SG_{a,y}$	=	Is the total volume of stack gas from the anaerobic digestion in year *y* (m^3/yr)
$MC_{N2O,a,y}$	=	Is the monitored content of nitrous oxide in the stack gas from anaerobic digestion in year *y* (tN_2O/m^3)
GWP_{N2O}	=	Is the Global Warming Potential of nitrous oxide (tCO_2e /tN_2O)
$MC_{CH4,a,y}$	=	Is the monitored content of methane in the stack gas from anaerobic digestion in year *y* (tCH_4/m^3)
GWP_{CH4}	=	Is the Global Warming Potential of methane (tCO_2e /tCH_4)

Emissions from gasification ($PE_{g,y}$) or combustion of RDF/Stabilized Biomass ($PE_{r,y}$) or waste incineration($PE_{i,y}$)

The stack gas from the gasification process and the combustion of RDF[2] may contain small amounts of methane and nitrous oxide. Moreover, fossil-based waste CO_2 emissions from the gasification process and the combustion of RDF should be accounted for.

$$PE_{g/r/i,y} = PE_{g/r/i,f,y} + PE_{g/r/i,s,y} \quad \textbf{(7)}$$

Where:

$PE_{g/r/i,f,y}$	=	Is the fossil-based waste CO_2 emissions from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (tCO_2e)
$PE_{g/r/i,s,y}$	=	Is the N_2O and CH_4 emissions from the final stacks from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (tCO_2e)

Emissions from fossil-based waste ($PE_{g/r/i,f,y}$)

The CO_2 emissions are calculated based on the monitored amount of fossil-based waste fed into the gasifier, waste incineration plant or RDF/stabilized biomass combustion, the fossil-derived carbon content, and combustion efficiency. The calculation of CO_2 derived from gasification/incineration of waste of fossil origin and combusting RDF/stabilized biomass including waste of fossil origin, is estimated using either of the following options:

Option 1:

$$PE_{g/r/i,f,y} = \sum_i A_i \times CCW_i \times FCF_i \times EF \times \frac{44}{12} \quad \textbf{(8)}$$

2. Where:

[2] RDF can be combusted to produce electricity, thermal energy or both (cogeneration).

$PE_{g/r/i,f,y}$ = Is the fossil-based waste CO_2 emissions from gasification/RDF-combustion/waste incineration in year *y* (tCO_2e)
A_i = Is the amount of waste type i fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant (t/yr)
CCW_i = Is the fraction of carbon content in waste type i (fraction)
FCF_i = Is the fraction of fossil carbon in total carbon of waste type *i* (fraction)
EF = Is the combustion efficiency for waste (fraction)
44/12 = Is the conversion factor (tCO_2/tC)

The amount of waste type i fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant (A_i) will be continuously monitored or calculated as per the following equation:

$$A_i = A_{MSW,y} \frac{\sum_{n=1}^{z} p_{n,i,y}}{z} \quad \textbf{(9)}$$

Where:
A_i = Is the amount of waste type *i* fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant (t/yr)
$A_{MSW,y}$ = Is the amount of MSW fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant (t/yr)
pn,j,y = Is the weight fraction of the waste type *i* in the sample n collected during the year *y*
Z = Number of samples collected during the year *y*

Option 2

$$PE_{g/r/i,f,y} = A_{MSW,y} \times FCF_{MSW} \times EF \times \frac{44}{12} \quad \textbf{(10)}$$

Where:
$PE_{g/r/i,f,y}$ = Is the fossil-based waste CO_2 emissions from gasification/RDF-combustion/waste incineration in year *y* (tCO_2e)
$A_{MSW,y}$ = Is the amount of MSW fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant(t/yr)
FCF_{MSW} = Is the fraction of fossil carbon in MSW (fraction)
EF = Is the combustion efficiency for waste (fraction)
44/12 = Is the conversion factor (tCO_2/tC)

Emissions from gasification stacks or RDF/stabilized biomass combustion or waste incineration ($PE_{g/r/i,s,y}$)

Emissions of N2O and CH4 may be estimated from either of the options given below:

Option 1:

$$PE_{g/r/i,s,y} = SG_{g/r,y} * MC_{N2O,g/r/i,y} * GWP_{N2O} + SG_{g/r/i,y} * MC_{CH4,g/r/i,y} * GWP_{CH4} \quad \textbf{(11)}$$

Where:
$PE_{g/r/i,s,y}$ = Is the total emissions of N_2O and CH_4 from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (tCO_2e)
$SG_{g/r/i,y}$ = Is the total volume of stack gas from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (m3/yr)
$MC_{N2O,g/r/i,y}$ = Is the monitored content of nitrous oxide in the stack gas from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (tN2O/m3)

GWP_{N2O} = Is the Global Warming Potential of nitrous oxide (tCO_2e/tN_2O)
$MC_{CH4,g/r/i,y}$ = Is the monitored content of methane in the stack gas from gasification, waste incineration or RDF/stabilized biomass combustion in year *y* (tCH_4/m^3)
GWP_{CH4} = Is the Global Warming Potential of methane (tCO_2e/tCH_4)

Option 2:

$$PE_{g/r/i,s,y} = Q_{biomass,y} \cdot \left(EF_{N2O} \cdot GWP_{N2O} + EF_{CH4} \cdot GWP_{CH4}\right) \cdot 10^{-3} \quad \textbf{(12)}$$

Where:
$Q_{biomass,y}$ = Is the amount of waste gasified, incinerated or RDF/stabilized biomass combusted in year *y* (tonnes/yr)
EF_{N2O} = Is the aggregate N_2O emission factor for waste combustion (kgN_2O/tonne of waste)
EF_{CH4} = Is the aggregate CH_4 emission factor for waste combustion ($kgCH_4$/tonne of waste)

Tables 5.4 and 5.3, chapter 5, volume 5 of IPCC 2006 guidelines should be used to estimate EF_{N2O} and EF_{CH4} , respectively.

In case the RDF/stabilized biomass is used offsite, N_2O and CH_4 emissions should be accounted for as leakage and estimated as per one of the options given above.

If IPCC default emission factor is used, a conservativeness factor should be applied to account for the high uncertainty of the IPCC default values. The level of the conservativeness factor depends on the uncertainty range of the estimate for the IPCC default N_2O and CH_4 emission factor. Project participants shall select the appropriate conservativeness factor from Table 3 below and shall multiply the estimate for the N_2O/CH_4 emission factor with the conservativeness factor.

Table: Conservativeness Factor

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factor where higher values are more conservative
Less than or equal to 10	7	1.02
Greater than 10 and less than or equal to 30	20	1.06
Greater than 30 and less than or equal to 50	40	1.12
Greater than 50 and less than or equal to 100	75	1.21
Greater than 100	150	1.37

Emissions from wastewater treatment ($PE_{w,y}$)

If the project activity includes wastewater release, methane emissions shall be estimated. If the wastewater is treated using aerobic treatment process, the CH_4 emissions from wastewater treatment are assumed to be zero. If wastewater is treated anaerobically or released untreated, CH_4 emissions are estimated as follows:

$$PE_{CH4,w,y} = Q_{COD,y} \cdot P_{COD,y} \cdot B_0 \cdot MCF_p \quad \textbf{(13)}$$

3. Where:
$PE_{CH4,w,y}$ = Methane emissions from the wastewater treatment in year *y* (tCH_4/y)
$Q_{COD,y}$ = Amount of wastewaster treated anaerobically or released untreated from the project activity in year *y* (m3/yr), which shall be measured monthly and aggregately annually
$P_{COD,y}$ = Chemical Oxygen Demand (COD) of wastewaster ($tCOD/m^3$), which will be measured monthly and averaged annually
B_0 = Maximum methane producing capacity ($tCH_4/tCOD$)

MCF_p = Methane conversion factor (fraction), preferably local specific value should be used. In absence of local values, MCF_p default values can be obtained from table 6.3, chapter 6, volume 4 from IPCC 2006 guidelines

IPCC 2006 guidelines specifies the value for B_0 as 0.25 kg CH_4/kg COD. Taking into account the uncertainty of this estimate, project participants should use a value of 0.265 kg CH_4/kg COD as a conservative assumption for B_o.

In case of all the CH_4 are emitted into air directly, then:

$$PE_{w,y} = PE_{CH4,w,y} \cdot GWP_{CH4} \quad \textbf{(14)}$$

If flaring occurs, the "Tool to determine project emissions from flaring gases containing methane" should be used to estimate methane emissions. In this case, $PE_{CH4,w,y}$ will be calculated ex-ante as per equation 17, and then monitored during the crediting period.

Emissions from thermal energy generation/electricity generation (from on-site fossil fuel consumption during co-firing) **($PE_{co\text{-}firing,y}$)**

Project participants shall account for CO_2 emissions associated to thermal energy generation/electricity if any from any on-site fossil fuel combustion during co-firing with waste (other than electricity use as mentioned above ($PE_{elec,y}$) and from fuel use on-site ($PE_{fuel,\ on\text{-}site,y}$)) and is calculated from the quantity of fossil fuel used for thermal energy generation/electricity generation and the specific CO_2 emission factor of the fossil fuel, as follows:

$$PE_{co\text{-}firing,y} = F_{co\text{-}firing,y} * NCV_{co\text{-}firing} * EF_{co\text{-}firing} \quad \textbf{(15)}$$

Where:

$PE_{co\text{-}firing,y}$ = Is the CO_2 emissions due to thermal energy generation/electricity from on-site fossil fuel combustion in year *y* (tCO_2)

$F_{co\text{-}firing,y}$ = Is the fossil fuel consumption for thermal energy generation/electricity in year *y* (l or kg)

$NCV_{co\text{-}firing}$ = Is the net caloric value of the fossil fuel used for thermal energy generation (MJ/l or MJ/kg)

$EF_{co\text{-}firing}$ = Is the CO_2 emissions factor of the fossil fuel used for thermal energy generation/electricity (tCO_2/MJ)

Baseline Emissions

To calculate the baseline emissions project participants shall use the following equation:

$$BE_y = (MB_y - MD_{reg,y}) + BE_{EN,y} \quad \textbf{(16)}$$

Where:

BE_y = Is the baseline emissions in year *y* (tCO_2e)

MB_y = Is the methane produced in the landfill in the absence of the project activity in year *y* (t_4CO_2e)

$MD_{reg,y}$ = Is methane that would be destroyed in the absence of the project activity in year *y* (t_4CO_2e)

$BE_{EN,y}$ = Baseline emissions from generation of energy displaced by the project activity in year *y* (tCO_2e)

Adjustment Factor (AF)

In cases where regulatory or contractual requirements do not specify $MD_{reg,y}$, an Adjustment Factor (AF) shall be used and justified, taking into account the project context. In doing so, the project participant

should take into account that some of the methane generated by the landfill may be captured and destroyed to comply with other relevant regulations or contractual requirements, or to address safety and odour concerns.

$$MD_{reg,y} = MB_y * AF \quad \textbf{(17)}$$

Where:

AF = Is Adjustment Factor for MB_y (%)

The parameter AF shall be estimated as follows:

- In cases where a specific system for collection and destruction of methane is mandated by regulatory or contractual requirements, the ratio between the destruction efficiency of that system and the destruction efficiency of the system used in the project activity shall be used;
- In cases where a specific percentage of the "generated" amount of methane to be collected and destroyed is specified in the contract or mandated by the regulation, this percentage divided by an assumed efficiency for the collection and destruction system used in the project activity shall be used.

The 'Adjustment Factor' shall be revised at the start of each new crediting period taking into account the amount of GHG flaring that occurs as part of common industry practice and/or regulation at that point in the future.

Rate of compliance

In cases where there are regulations that mandate the use of one of the project activity treatment options and which is not being enforced, the baseline scenario is identified as a gradual improvement of waste management practices to the acceptable technical options expected over a period of time to comply with the MSW Management Rules. The adjusted baseline emissions ($BE_{y,a}$) are calculated as follows:

$$BE_{y,a} = BE_y * (1 – RATE^{Compliance}{}_y) \quad \textbf{(18)}$$

Where:

BE_y = Is the CO_2-equivalent emissions as determined from equation 20~~14~~

$RATE^{Compliance}{}_y$ = Is the state-level compliance rate of the MSW Management Rules in that year *y*. The compliance rate shall be lower than 50%; if it exceeds 50% the project activity shall receive no further credit

In such cases $BE_{y,a}$ should replace BE_y in Equation (36) to estimate emission reductions.

The compliance ratio $RATE^{Compliance}{}_y$ shall be monitored *ex post* based on the official reports for instance annual reports provided by municipal bodies.

Methane generation from the landfill in the absence of the project activity (MB_y)

The amount of methane that is generated each year (MB_y) is calculated as per the latest version of the approved methodological tool "Emissions from solid waste disposal sites" considering the following additional equation:

$$MB_y = BE_{CH4,SWDS,y} \quad \textbf{(19)}$$

Where:

$BE_{CH4,SWDS,y}$ = Is the methane generation from the landfill in the absence of the project activity at year *y* that is methane emissions avoided during the year *y* from preventing waste disposal at the solid waste disposal site during the period from the start of the project activity to the end of the year *y* (tCO_2e) as calculated using Application B in the methodological tool "Emissions from solid waste disposal sites". The tool estimates methane generation adjusted for, using adjustment factor (f_y), any landfill gas in the baseline that would have been captured and destroyed to comply with relevant regulations or contractual requirements, or to address safety and odour concerns. As this is already accounted for in equation 20, in this methodology, "f_y" in the tool shall be assigned a value 0

Note: Where for a particular year it cannot be demonstrated that the waste would have been disposed of in the landfill, the waste quantities prevented from disposal ($W_{j,x}$) in the tool should be assigned a value 0 (zero).

$A_{j,x}$ = Is the amount of organic waste type *j* prevented from disposal in the landfill in the year *x* (tonnes/year), this is the value to be used for variable $W_{j,x}$ in the methodological tool "Emissions from solid waste disposal sites"

Baseline emissions from generation of energy

Scenario 1 (see Table 1 above)

$$BE_{EN,y} = BE_{elec,y} + BE_{thermal,y} \quad \textbf{(20)}$$

4. Where:

$BE_{elec,y}$ = Is the baseline emissions from electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity and exported to the grid or displacing onsite/offsite fossil fuel captive power plant (tCO_2e)

$BE_{thermal,y}$ = Is the baseline emissions from thermal energy produced utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing thermal energy from onsite/offsite fossil fuel fuelled boiler (tCO_2e)

$$BE_{elec,y} = EG_{d,y} * CEF_d \quad \textbf{(21)}$$

Where:

$EG_{d,y}$ = Is the amount of electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity and exported to the grid or displacing onsite/offsite fossil fuel captive power plant during the year *y* (MWh)

CEF_d = Is the carbon emissions factor for the displaced electricity source in the project scenario (tCO_2/MWh)

Determination of CEF_d

Where the project activity involves electricity generation from the biogas/syngas/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel , CEF_d should be chosen as follows:

- In case the generated electricity from the biogas/syngas/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel displaces electricity that would have been generated by an on-site/off-site fossil fuel fired captive power plant in the baseline, project proponents shall estimate the emission factor as follows:

$$CEF_d = \frac{EF_{fuel,b}}{\varepsilon_{gen,b}} * 3.6 \cdot \quad \textbf{(22)}$$

Where:

$EF_{fuel,b}$ = Is the emission factor of baseline fossil fuel used, as identified in the baseline scenario identification procedure, expressed in tCO_2/GJ

$\varepsilon_{gen,b}$ = Is the efficiency of baseline power generation plant

3.6 = Equivalent of GJ energy in a MWh of electricity

To estimate electricity generation efficiency, project participants may use the highest value among the following three values as a conservative approach:

(1) Measured efficiency prior to project implementation;

(2) Measured efficiency during monitoring;

(3) Data from manufacturer for efficiency at full load;

(4) Default efficiency of 60%.

- In case the generated electricity from the biogas/syngas/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel displaces electricity that would have been generated by other power plants in the grid in the baseline, CEF_d should be calculated according to the "Tool to calculate the emission factor for an electricity system".

$$BE_{thermal,y} = \frac{Q_y}{\varepsilon_{boiler} \cdot NCV_{fuel}} \cdot EF_{fuel,b} \quad \textbf{(23)}$$

Where :

Q_y = The quantity of thermal energy produced utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing thermal energy from onsite/offsite fossil fuel fuelled boiler during the year *y* in GJ

ε_{boiler} = The energy efficiency of the boiler used in the absence of the project activity to generate the thermal energy

NCV_{fuel} = Net calorific value of fuel, as identified through the baseline identification procedure, used in the boiler to generate the thermal energy in the absence of the project activity in GJ per unit of volume or mass

$EF_{fuel,b}$ = Emission factor of the fuel, as identified through the baseline identification procedure, used in the boiler to generate the thermal energy in the absence of the project activity in tons CO_2 per unit of volume or mass of the fuel

To estimate boiler efficiency, project participants may choose between the following two options:

Option A:

Use the highest value among the following three values as a conservative approach:

(1) Measured efficiency prior to project implementation;

(2) Measured efficiency during monitoring;

(3) Manufacturer's information on the boiler efficiency.

Option B:

Assume a boiler efficiency of 100% based on the net calorific values as a conservative approach.

In determining the CO_2 emission factors (EF_{fuel}) of fuels, reliable local or national data should be used if available. Where such data is not available, IPCC default emission factors should be chosen in a conservative manner.

Scenario 2 (see Table 1 above):

Baseline emissions from electricity and heat cogeneration

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

$$BE_{EN,y} = \frac{(EG_{d,y} \cdot 3.6) * 10^{-3} + Q_y}{\eta_{cogen}} \cdot EF_{fuel,c} \quad \textbf{(24)}$$

Where:

5. 3.6 = Conversion factor, expressed as TJ/GWh

$EF_{fuel,c}$ = Is the CO_2 emission factor per unit of energy of the fuel that would have been used in the baseline cogeneration plant in (tCO_2/TJ), obtained from reliable local or national data if available, otherwise, taken from the country specific IPCC 2006 default emission factors

Qy = The quantity of thermal energy produced utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing thermal energy from cogeneration during the year *y* in TJ

$EG_{d,y}$ = Is the amount of electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing onsite/offsite cogeneration plant during the year *y* in GWh

η_{Cogen} = The efficiency of cogeneration plant that would have been used in the absence of the project activity

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.

Leakage

The sources of leakage considered in the methodology are CO_2 emissions from off-site transportation of waste materials in addition to CH_4 and N_2O emissions from the residual waste from the anaerobic digestion, gasification processes and processing/combustion of RDF. In case of waste incineration, leakage emissions from residual waste of MSW incinerator should be accounted for. Positive leakage

that may occur through the replacement of fossil-fuel based fertilizers with organic composts are not accounted for. . Otherwise, leakage emissions should be estimated from the following equation:

$$L_y = L_{t,y} + L_{r,y} + L_{i,y} + L_{s,y} + L_{COMP,y} \quad \textbf{(25)}$$

Where:

$L_{t,y}$	=	Is the leakage emissions from increased transport in year *y* (tCO_2e)
$L_{r,y}$	=	Is the leakage emissions from the residual waste from the anaerobic digester, the gasifier, the processing/combustion of RDF/stabilized biomass, in case it is disposed of in landfills in year *y* (tCO_2e)
$L_{i,y}$	=	Is the leakage emissions from the residual waste from MSW incinerator in year *y* (tCO_2e)
$L_{s,y}$	=	Is the leakage emissions from end use of stabilized biomass
$L_{COMP,y}$	=	Leakage emissions associated with composting in year *y* ($t CO_2e$ / yr)

Emissions from transportation ($L_{t,y}$)

The project may result in a change in transport emissions. This would occur when the waste is transported from waste collecting points, in the collection area, to the treatment facility, instead of to existing landfills. When it is likely that the transport emissions will increase significantly, such emissions should be incorporated as leakage. In this case, project participants shall document the following data in the CDM-PDD: an overview of collection points from where the waste will be collected, their approximate distance (in km) to the treatment facility, existing landfills and their approximate distance (in km) to the nearest end-user.

For calculations of the emissions, IPCC default values for fuel consumption and emission factors may be used. The CO_2 emissions are calculated from the quantity of fuel used and the specific CO_2-emission factor of the fuel for vehicles *i* to *n*, as follows:

$$L_{t,y} = \sum_{i}^{n} NO_{vehicles,i,y} * DT_{i,y} * VF_{cons,i} * NCV_{fuel} * D_{fuel} * EF_{fuel} \quad \textbf{(26)}$$

Where:

$NO_{vehicles,i,y}$	=	Is the number of vehicles for transport with similar loading capacity
$DT_{i,y}$	=	Is the average additional distance travelled by vehicle type i compared to baseline in year *y* (km)
$VF_{cons,i}$	=	Is the vehicle fuel consumption in litres per kilometre for vehicle type *i* (l/km)
NCV_{fuel}	=	Is the Calorific value of the fuel (MJ/Kg or other unit)
D_{fuel}	=	Is the fuel density (kg/l), if necessary
EF_{fuel}	=	Is the Emission factor of the fuel (tCO_2/MJ)

Emissions from residual waste from anaerobic digester, gasifier, and processing/combustion of RDF/stabilized biomass or compost in case it is disposed of in landfills ($L_{r,y}$)

For the residual waste from the anaerobic digestion, the gasification processes, and the processing/combustion of RDF/stabilized biomass the weight ($A_{ci,x}$) of each of the waste types *i* in year *x* should be estimated. Leakage emissions from this residual waste should be estimated using the determined weights as follows:

6. In case the residual waste is aerobically treated through composting, emissions shall be estimated as per the methodological tool to estimate "Project and leakage emissions from composting".

In case the residual waste is delivered to a landfill, CH_4 emissions are estimated through equation 23 using estimated weights of each waste type ($A_{ci,x}$). As a conservative approach, residual waste can be assumed to only include a single waste type that was fed into the process (anaerobic digestion, the gasification processes, and the processing/combustion of RDF/stabilized biomass) which results in less emission reductions.

Leakage Emissions from the residual waste from MSW incineration ($L_{i,y}$)

In case of waste incineration, leakage emissions from the residual waste of MSW incinerator should be accounted for using the following equations:

If the residual waste from the incinerator contains up to 5% residual carbon then:

$$L_{i,y} = A_{residual}.FC_{residual}.\frac{44}{12} \quad \textbf{(27)}$$

If the residual waste from the incinerator contains more than 5% residual carbon[3] then:

$$L_{i,y} = A_{residualy}\cdot 0.05\cdot\frac{44}{12} + A_{residual,y}\cdot(FC_{residual} - 0.05)\cdot\frac{16}{12}\cdot 21 \quad \textbf{(28)}$$

Where:

$L_{i,y}$	=	Is the leakage emissions from the residual waste of MSW incinerator in year *y* (tCO_2e)
$A_{residual,y}$	=	Is the amount of the residual waste from the incinerator (t/yr)
$FC_{residual}$	=	Is the fraction of residual carbon contained in the residual waste (%)
$\frac{44}{12}$	=	Is a factor to convert from Carbon to Carbon Dioxide
$\frac{16}{12}$	=	Is factor to convert from Carbon to methane
21	=	Is the Global Warming Potential of methane (tCO_2/tCH_4)

Off-site Emissions from end use of the stabilized biomass ($L_{s,y}$)

Project proponents have to demonstrate that there is no emission associated to non-combustion end-use of stabilized biomass (SB) and that the SB is indeed stabilized. If SB is used as raw material in furniture, fertilizers or ceramic industry, no leakage other than transportation change is expected. Unless the project proponent can prove that SB for furniture industry will not be combusted in the end of its life cycle, to be conservative, the emissions will be considered using the same rationale as per equations 12 and 13 or 14.

For amount of RDF/stabilized biomass used off-site for which no sale invoices can be provided, and in cases where the project proponents cannot provide analysis of the capacity of RDF/stabilized biomass for moisture absorption, leakage emissions should be accounted for as follows:

Quantities of different types of waste input ($A_{j,x}$) to the RDF/biomass processing should be adjusted by an annual adjustment factor SA_y as follows:

$$A_{s,j,x} = SA_y * A_{j,x} \quad \textbf{(29)}$$

[3] In this case, it is assumed that all the carbon in the residual waste will be converted to methane. This provision is included to offer an incentive for Project Proponents to operate their incinerator efficiently.

$$SA_y = \left(\frac{R_n}{R_t} \right) \quad \textbf{(30)}$$

Where:

SA_y	=	Is an adjustment factor for a specific year
R_n	=	Is the weight of RDF/stabilized biomass sold offsite for which no sale invoices can be provided (t/yr)
R_t	=	Is the total weight of RDF/stabilized biomass produced (t/yr)

Annual leakage methane emissions ($L_{s,y}$) is calculated as per the latest version of the approved methodological tool "Emissions from solid waste disposal sites", considering the following additional equation and using the adjusted weights ($A_{s,j,x}$) of waste input to the RDF/stabilized biomass processing facility for variable $W_{j,x}$:

$$L_{s,y} = BE_{CH4,SWDS,y} \quad \textbf{(31)}$$

Where:

$BE_{CH4,SWDS,y}$	=	Is the methane generation from the landfill in the absence of the project activity, calculated as per the methodological tool "Emissions from solid waste disposal sites"

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".

Emissions Reductions

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

$$ER_y = BE_y - PE_y - L_y \quad \textbf{(32)}$$

Where:

ER_y	=	Is the emissions reductions in year *y* (t CO_2e)
BE_y	=	Is the emissions in the baseline scenario in year *y* (tCO_2e)
PE_y	=	Is the emissions in the project scenario in year *y* (tCO_2e)
L_y	=	Is the leakage in year *y* (tCO_2e)

If the sum of PE_y and L_y is smaller than 1% of BE_y in the first full operation year of a crediting period, the project participants may assume a fixed percentage of 1% for PE_y and L_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 tCO_2e occur in the year t and positive emission reductions of 100 tCO_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.)

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter:	$EG_{PJ,FF,y}$
Data unit:	MWh
Description:	Amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid as a result of the project activity
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. The readings will be double checked by the electricity distribution company
Any comment:	

Data / Parameter:	CEF_{elec}
Data unit:	tCO_2/MWh
Description:	Emission factor for the production of electricity in the project activity
Source of data:	Official utility documents
Measurement procedures (if any):	Calculated according to the "Tool to calculate the emission factor for an electricity system", or as diesel default factor according to AMS I.D, Table I.D.1, if the conditions of the table are fulfilled or according to data from captive power plant, if any
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	Calculated as per appropriate methodology at start of crediting period
Any comment:	

Data / Parameter:	$F_{cons,y}$
Data unit:	mass or volume units of fuel
Description:	Fuel consumption on-site during year *y* of the crediting period
Source of data:	Purchase invoices and/or metering
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	The amount of fuel will be derived from the paid fuel invoices (administrative obligation)
Any comment:	This parameter includes the auxiliary fossil fuels that need to be added in the incinerator or used for mechanical or thermal treatment process

Data / Parameter:	NCV_{fuel}
Data unit:	MJ/mass or volume units of fuel
Description:	Net calorific value of fuel
Source of data:	The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	
Any comment:	

Data / Parameter:	EF_{fuel}
Data unit:	tCO_2/MJ
Description:	Emission factor of the fuel
Source of data:	The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	
Any comment:	

Data / Parameter:	P_l
Data unit:	fraction
Description:	Leakage of methane emissions from anaerobic digester
Source of data:	IPCC or project participant
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	The value itself is highly variable, but reference data shall be used, as well as measurement by project participants
Any comment:	

Data / Parameter:	$M_{a,y}$
Data unit:	tCO_2/year
Description:	Total methane produced from anaerobic digester
Source of data:	Project participants
Measurement procedures (if any):	
Monitoring frequency:	Continuous
QA/QC procedures:	Data can be checked from usage records
Any comment:	This quantity is necessary to calculate the leakage of methane from the digester which has a default leakage of 15%

Data / Parameter:	$SG_{a,y}$
Data unit:	m^3/yr
Description:	Stack gas volume flow rate
Source of data:	Project participants
Measurement procedures (if any):	
Monitoring frequency:	Continuous or periodic (at least quarterly)
7. 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:	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, it is sufficient to monitor one stack of each type. The stack gas volume flow rate may be estimated by summing the inlet biogas and air flow rates and adjusting for stack temperature. Air inlet flow rate should be estimated by direct measurement using a flow meter

Data / Parameter:	$MC_{N2O,a,y}$
Data unit:	tN_2O/m^3
Description:	Concentration of N_2O in stack gas
Source of data:	Project participants
Measurement procedures (if any):	
Monitoring frequency:	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:	More frequent sampling is encouraged

Data / Parameter:	$MC_{CH4,a,y}$
Data unit:	tCH_4/m^3
Description:	Concentration of CH_4 in stack gas
Source of data:	Project Participants
Measurement procedures (if any):	
Monitoring frequency:	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:	More frequent sampling is encouraged

Data / Parameter:	$A_{MSW,y}$
Data unit:	tonnes/yr
Description:	Amount of MSW fed into the gasifier or RDF/stabilized biomass combustor or into the waste incineration plant
Source of data:	Project participants
Measurement procedures (if any):	Measured with calibrated scales/load cells
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	
Any comment:	

Data / parameter:	$P_{n,i,y}$
Data unit:	-
Description:	Weight fraction of the waste type *i* in the sample *n* collected during the year *y*
Source of data:	Sample measurements by project participants
Measurement procedures (if any):	
Monitoring frequency:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year
QA/QC procedures:	
Any comment:	

Data / Parameter:	z
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:	CCW_i
Data unit:	Fraction
Description:	Fraction of carbon content in waste type *i*
Source of data:	IPCC or other reference data
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	FCF_i
Data unit:	8. fraction
Description:	Faction of fossil carbon in total carbon of waste type *i*
Source of data:	Sample measurements by project participants
Measurement procedures (if any):	The following standards should be used to estimate fossil carbon fraction of waste type *i:* • ASTM D6866-08: "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis"; • ASTM D7459-08: "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil-Derived Carbon Dioxide Emitted from Stationary Emissions Sources"
Monitoring frequency:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year
QA/QC procedures:	
Any comment:	

Data / Parameter:	FCF_{MSW}
Data unit:	Fraction
Description:	Fraction of fossil carbon in MSW
Source of data:	Sample measurements by project participants
Measurement procedures (if any):	The following standards should be used: • ASTM D6866-08: "Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis"; • ASTM D7459-08: "Standard Practice for Collection of Integrated Samples for the Speciation of Biomass (Biogenic) and Fossil-Derived Carbon Dioxide Emitted from Stationary Emissions Sources"
Monitoring frequency:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year. Samples need to be representative of all categories of waste. DOEs should check the consistency between the sample composition sent to labs for determining fossil carbon in waste and the actual waste received on site. Project proponents are required to keep records of the composition of the waste sample sent for testing. Lab results reports for fossil carbon should also include the composition of the waste sample that was tested
QA/QC procedures:	

Any comment:	

Data / Parameter:	EF
Data unit:	Fraction
Description:	Combustion efficiency for waste
Source of data:	The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	$SG_{g/r/i,y}$
Data unit:	m^3/yr
Description:	Total volume of stack gas from gasification, waste incineration or RDF/stabilized biomass combustion in year *y*
Source of data:	Project site
Measurement procedures (if any):	
Monitoring frequency:	Continuous or periodic (at least quarterly)
QA/QC procedures:	
Any comment:	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, it is sufficient to monitor one stack of each type. The stack gas volume flow rate may be estimated by summing the inlet biogas and air flow rates and adjusting for stack temperature. Air inlet flow rate should be estimated by direct measurement using a flow meter

Data / Parameter:	$MC_{N2O,g/r/i,y}$
Data unit:	tN_2O/m^3
Description:	Monitored content of nitrous oxide in the stack gas from gasification, waste incineration or RDF combustion in year *y*
Source of data:	Project site
Measurement procedures (if any):	
Monitoring frequency:	At least quarterly
QA/QC procedures:	
Any comment:	More frequent sampling is encouraged

Data / Parameter:	$MC_{CH4,g/r/i,y}$
Data unit:	tCH_4/m^3
Description:	Monitored content of methane in the stack gas from gasification, waste incineration or RDF/stabilized combustion in year *y*
Source of data:	Project site
9. Measurement procedures (if any):	
10. Monitoring frequency:	At least quarterly
QA/QC procedures:	
Any comment:	More frequent sampling is encouraged

Data / Parameter:	MB_y
Data unit:	tCH_4
Description:	Methane produced in the landfill in the absence of the project activity in year *y*
Source of data:	Calculated as per the methodological tool "Emissions from solid waste disposal sites"
Measurement procedures (if any):	As per the methodological tool "Emissions from solid waste disposal sites"
Monitoring frequency:	As per the methodological tool "Emissions from solid waste disposal sites"
QA/QC procedures:	As per the methodological tool "Emissions from solid waste disposal sites"
Any comment:	-

Data / Parameter:	AF
Data unit:	%
Description:	Methane destroyed due to regulatory or other requirements
Source of data:	Local and/or national authorities
Measurement procedures (if any):	
Monitoring frequency:	At renewal of crediting period
QA/QC procedures:	Data are derived from or based upon local or national guidelines, so QA/QC-procedures for these data are not applicable
Any comment:	Changes in regulatory requirements, relating to the baseline landfill(s) need to be monitored in order to update the adjustment factor (AF), or directly MD_{reg}. This is done at the beginning of each crediting period

Data / Parameter:	$EG_{d,y}$
Data unit:	MWh
Description:	Amount of electricity generated utilizing the biogas/syngas collected/RDF/stabilized biomass/combustion heat from incineration/stabilized biomass co-fired with fossil fuel in the project activity displacing electricity in the baseline during the year *y*
Source of data:	Electricity meter
Measurement procedures (if any):	
Monitoring frequency:	Continuous

QA/QC procedures:	
Any comment:	

Data / Parameter:	CEF_d
Data unit:	tCO_2/MWh
Description:	Emission factor of displaced electricity by the project activity
Source of data:	Captive power plant: estimated as per equation 26 Grid: as per the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	$RATE^{Compliance}_{y}$
Data unit:	Number
Description:	Rate of compliance
Source of data:	Municipal bodies
Measurement procedures (if any):	The compliance rate is based on the annual reporting of the municipal bodies issuing these reports. The state-level aggregation involves all landfill sites in the country. If the rate exceeds 50%, no CERs can be claimed
Monitoring frequency:	Annual
QA/QC procedures:	
Any comment:	

Data / Parameter:	$NO_{vehicles,i,y}$
Data unit:	Number
Description:	Vehicles per carrying capacity per year
Source of data:	Counting
Measurement procedures (if any):	Counter should accumulate the number of trucks per carrying capacity
Monitoring frequency:	Annually
QA/QC procedures:	Procedures will be checked regularly by DOE
Any comment:	

Data / Parameter:	$DT_{i,y}$
Data unit:	km
Description:	Average additional distance travelled by vehicle type *i* compared to the baseline in year *y*
Source of data:	Expert estimate
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	Assumption to be approved by DOE
Any comment:	

Data / Parameter:	$VF_{cons,i}$
Data unit:	L/km
Description:	Vehicle fuel consumption in litres per kilometre for vehicle type *i*
Source of data:	Fuel consumption record
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	D_{fuel}
Data unit:	kg/L
Description:	Density of fuel
Source of data:	11. The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	
Any comment:	Not necessary if NCV_{fuel} is demonstrated on a per liter basis

Data / Parameter:	$Q_{biomass,y}$
Data unit:	tonne/yr
Description:	Amount of waste gasified, incinerated or RDF/stabilized biomass combusted in year *y*
Source of data:	
Measurement procedures (if any):	All produced stabilized biomass will be trucked off from site. All trucks leaving site will be weighed. Possible temporary storage of stabilized biomass will be weighed as well or not taken into account for calculated carbon credits
Monitoring frequency:	
QA/QC procedures:	
Any comment:	

Data / Parameter:	EF_{N2O}
Data unit:	kgN_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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
12. Monitoring frequency:	
13. QA/QC procedures:	
Any comment:	

Data / Parameter:	EF_{CH4}
Data unit:	$KgCH_4$/tonne waste (dry)
Description:	Aggregate CH_4 emission factor for waste incineration
Source of data:	As per guidance from the Board, IPCC default values should 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:	

Data / Parameter:	Degradability analysis
Data unit:	
Description:	Project proponent shall provide degradability analysis on an annual basis to demonstrate that the methane generation in the life-cycle of the SB is negligible
Source of data:	Project site
Measurement procedures (if any):	Measurement of absorption capacity for moisture of SB according to appropriate standards
Monitoring frequency:	Annually
QA/QC procedures:	
Any comment:	If the PPs produce different types of SB, they should provide this analysis for each SB type separately

Data / Parameter:	Amount of RDF/stabilized biomass used outside the project boundary
Data unit:	Tons
Description:	Project Proponents shall monitor the amount of the RDF/stabilized biomass sold for use outside of the project boundary
Source of data:	Project Site
14. Measurement procedures (if any):	Sale invoices of the RDF/stabilized biomass should be kept at the project site. They should contain Customer contact details, physical location of delivery, type, amount (in tons) and purpose of stabilized biomass (use as fuel or as material in furniture etc.). A list of customers and delivered SD amount should be kept at the project site
Monitoring frequency:	Weekly
QA/QC procedures:	
Any comment:	

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:	

Data / Parameter:	$A_{j,x}$
Data unit:	tonnes/yr
Description:	Amount of organic waste type j prevented from disposal in the landfill in the year *x* (tonnes/year)
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:	$A_{ci,x}$
Data unit:	tonnes/yr
Description:	Amount of residual waste type 'ci' from anaerobic digestion, gasifier or processing/combustion of RDF and stabilized biomass
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:	R_n
Data unit:	tonnes/yr
Description:	Weight of RDF/stabilized biomass sold offsite for which no sale invoices can be provided
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:	R_t
Data unit:	tonnes/yr
Description:	Total weight of RDF/stabilized biomass produced (t/yr)
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:	$A_{residual}$
Data unit:	tonnes/yr
Description:	The amount of the residual waste from the incinerator
Source of data:	Project participants
Measurement procedures (if any):	Weighbridge
Monitoring frequency:	Aggregated at least annually
QA/QC procedures:	
Any comment:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)

Data / Parameter:	$FC_{residual}$
Data unit:	%
Description:	Fraction of residual carbon in the residual waste of MSW incinerator
Source of data:	Sample measurements by project participants
Measurement procedures (if any):	
Monitoring frequency:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year
QA/QC procedures:	
Any comment:	

Data / Parameter:	$Q_{COD,y}$
Data unit:	m^3/yr
Description:	Amount of waste waster 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:	$tCOD/m^3$
Description:	Chemical Oxygen Demand (COD) of wastewaster
Source of data:	Measured value by purity 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:	$f_{c/g/d/r/i}$
Data unit:	%
Description:	Fraction of waste diverted, from the landfill to all project activities: composting/gasification/anaerobic digestion/RDF/stabilized biomass/ incineration
Source of data:	Plant records
Measurement procedures (if any):	
Monitoring frequency:	Monthly
QA/QC procedures:	
Any comment:	

Data / Parameter:	Q_y
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity 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

Data / Parameter:	-
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. Energy generated by fossil fuel < 0.50 x ($Qy + EG_{d,y}$)

Data / Parameter:	$F_{co\text{-}firing,y}$
Data unit:	mass or volume units of fossil fuel consumption
Description:	Fuel consumption on-site for thermal energy generation/ electricity generation during year *y* of the crediting period
Source of data:	Purchase invoices and/or metering
Measurement procedures (if any):	
Monitoring frequency:	Annually
QA/QC procedures:	The amount of fuel will be derived from the paid fuel invoices (administrative obligation)
Any comment:	This parameter includes the fossil fuels that are co-fired with stabilized biomass for thermal energy generation/ electricity generation

Data / Parameter:	$NCV_{co\text{-}firing,y}$
Data unit:	MJ/mass or volume units of fossil fuel
Description:	Net calorific value of fossil fuel used for thermal energy generation/electricity generation
Source of data:	The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{co\text{-}firing}$
Data unit:	tCO_2/MJ
Description:	Emission factor of the fossil fuel used for thermal energy generation/electricity generation

Source of data:	The source of data should 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 should be used only when country or project specific data are not available or difficult to obtain
Measurement procedures (if any):	
Monitoring frequency:	Annually or *ex ante*
QA/QC procedures:	
Any comment:	

B.7.2. Description of the monitoring plan for a generic CPA

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The range of parameters which will be monitored will be dependent on the specific arrangement of each CPA. The site specific requirements will therefore be provided within each CDM-SSC-CPA-DD.

Monitoring equipment and data capture systems will be provided. All equipment will be maintained and calibrated in accordance with the recommendations of the respective manufacturer. Contingency arrangements and backup equipment will be provided to allow for potential failure of key items.

All monitoring and maintenance activities, including collation and reporting of key project data, will be carried out by suitably qualified and trained personnel.

Automated data capture and recording systems will be employed wherever practicable. Archiving and backup systems will be in place to ensure the integrity of data throughout the crediting period.

An Environmental Monitoring Plan (EMP) will be developed for each CPA to provide a clear, concise and auditable set of procedures designed to ensure that all activities associated with the project activity are completed to a suitable standard. The EMP will include procedures for the following:

- Data collation and recording;
    - Type of data
    - Frequency of monitoring
    - Recording/reporting requirements
- Quality Control (QC) and Quality Assurance (QA);
- Training Requirements;
- Emergency response;
- Equipment maintenance and calibration;
- Equipment failure and back-up measures; and
- Project auditing process;
    - Internal project review audits;
    - Third party verification auditing.

Procedures will be developed for each CPA in conjunction with the process of system design and installation, which will be carried out by suitably qualified contractors and/or consultants who will be contracted by the City of Cape Town... Where CPAs are operated by entities other than the City of Cape Town, such entities will be contractually bound to appoint suitably qualified contractors or consultants who will be mandated to adhere to the relevant procedures.

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Appendix 1: Contact information on entity/individual responsible for the PoA

Organization	City of Cape Town
Street/P.O. Box	PO Box 298
Building	Civic Centre
City	Cape Town
State/Region	Western Cape
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Website	https://www.capetown.gov.za/
Contact person	Barry Coetzee
Title	Manager: Technical Strategic Support, Utility Services
Salutation	Mr
Last name	Coetzee
Middle name	-
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Department	Utility Services Directorate
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Appendix 2: Affirmation regarding public funding

Not applicable – The PoA does not receive public funding from Parties included in Annex 1 of the Kyoto Protocol

Appendix 3: Application of methodology(ies)

No additional information

Appendix 4: Further background information on ex ante calculation of emission reductions

No additional information

Appendix 5: Further background information on the monitoring plan

No Additional Information

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History of the document

Version	Date	Nature of revision(s)
14.0.0	20 July 2012	EB 68, Annex 8 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, 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 products and by-products from project activities employing the methodology may be used in project activities using other methodologies, and under which provisions syngas, RDF/SB and combustion waste by-products may be used in, for example, cement plants; • Change the structure of the methodology and make other editorial improvements; • Introduce provisions for the use of this methodology in a project activity under a programme of activities (PoA); • Change of the title from "Avoided emissions from organic waste through alternative waste treatment processes" to "Alternative waste treatment processes"; • Reference tools. Due to the overall modification of the document, no highlights of the changes are provided.
13.0.0	EB 65, Annex 12 25 November 2011	Revision to: • Replace the procedures for estimating 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		