PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-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

City of Cape Town Treatment of Organic Waste Streams CDM Projects
Version : 02
Date: 27/05/2013

A.2. Purpose and general description of the PoA

The proposed PoA will incorporate measures to be installed at existing and proposed WWTW in the Republic of South Africa. The co-ordinating/managing entity is the City of Cape Town which has already identified some sixteen WWTWs (treating in the over 70,000 tpa of dry solids. The measures employed (as detailed in this PoA) will allow for anaerobic digestion of a large portion of this sludge as well as the capture and utilisation of biogas formed during this process.

Sludge from the treatment of wastewater is currently disposed to lagoon (>2 m depth). Under the PoA, the sludge will be treated using enclosed anaerobic digesters, resulting in the controlled production of biogas which will be captured and combusted or utilised. In some cases, the potential uses of the gas includes the generation of heat in the sludge digestate drying process, which will provide further benefit by offsetting the consumption of light fuel oil, which is otherwise needed as a fuel to produce heat for drying. In some other cases, the gas will be used to produce electricity in custom built engines; the electricity produced will be utilized on a local grid (offsetting the consumption of power which would otherwise have been predominantly generated by fossil fuel sources). The sludge digestate may be dewatered in heat drying process or composted.

Policy/measure or stated goal that the PoA

The proposed PoA will reduce the amount of greenhouse gas (GHG) generated by the management of municipal wastewater and biomass waste within the Cape Town area. Sludge is currently disposed to anaerobic lagoon, which results in the generation of methane that is subsequently released to atmosphere.

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 where the energy is not recovered.

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

- reducing GHG emissions by avoiding emissions of methane to the atmosphere;
- reducing GHG emissions through the substitution of fossil-fuel consumption with biogas;
- increasing the use of renewable energy sources in the Cape Town area;

- transferring technology for anaerobic digestion;
- transferring knowledge and capacity building by implementation of the proposed PoA; and
- creating jobs as additional staff will be required during the development of a particular CPA, and then during the operation of the project activity in monitoring and operating the sludge treatment systems.

Contribute to Sustainable Development:

The proposed PoA will contribute to sustainable development within the Western Cape and the Republic of South Africa as a whole by virtue of the following:

Economic Development: The PoA project has significant importance in national economic development. Current national economy is heavily dependent on energy. This energy demand is likely to increase. In order to support sustainable development and growth it is vital that energy required for progress is sourced from renewable or green sources. Generating power from biogas is considered to be green as it does not rely on natural resources. In addition the project will contribute to national and local economic development by bringing foreign exchange into the country through the sale of carbon credits (Certified Emission Reductions, (CERs)). Contributions to economic development will be achieved through the creation of employment opportunities during the implementation of each CPA. The skills transfer and capacity building associated with the project are also considered as benefits to economic development.

Social Development: During construction and installation phase of each CPA, the project will enable local building companies to sustain and even grow employment ratios on all professional, skilled and unskilled levels. The project will also impact on additional companies providing consultation, raw materials and transportation to the project. Once the project is installed on a CPA level, it will result in the creation of some skilled professional-level jobs, which may be achieved by further education and professional development of current staff.

Environmental: The location for all of the proposed installations are within an existing or new WWTW. The installations themselves are not expected to contribute to the disturbance to ecosystems and they are unlikely to cause any loss of biodiversity. All is to be designed to minimise the disturbance of ecosystems and loss of biological diversity. Also, the normal operation of the biogas capture and transportation system does not result in pollution or degradation of the environment and the biogas collection system will improve the local environment by the collection of odorous and hazardous biogas, and the global environment by the combustion of the greenhouse gas with energy recovery. All construction, maintenance and operations will be carried out by qualified trained personnel according to site management and maintenance plan and by specification of the manufacturer to avoid and minimize any pollution to the environment. However, some waste will be generated during construction and installation phase. Any waste associated with the construction and installation of each CPA is to be handled in line with site-specific environmental and waste management programme being reused or recycled on site as far as possible, or collected and transported to an approved and certified recycling/treatment or disposal facility

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 other entities and municipalities in the Western Cape, who may in turn contract with technical specialists, who will be responsible for the assessment, project design, implementation, management, operation, repair and maintenance, monitoring of the treatment systems, data capturing and storage, production and transmission of information and reports, storage of data at each site, as determined by contract on approval of the applicable governing bodies.

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 or other organic waste streams using AD nor any of the proposed alternative treatment options encapsulated in this PoA. Please refer to evidence letter: ***130710_Voluntary letter of Action letter for TOW(PoA)***

A.3. CMEs and participants of PoA

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The CME of the PoA, who will communicate with the UNFCCC Executive Board, will be the City of Cape Town. By the process outlined in Section A.2, the City of Cape Town will be contracting with project developers for CPAs as part of the PoA for its own projects. Where such developers are rendering services to the City of Cape Town, such services will be procured according to South African law. Other project developers in the Western Cape will follow a similar approach. These appointments will be made following the completion of a thorough and transparent procurement process which must conform to South African Supply Chain Management legislation

A.4. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or 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)	City of Cape Town (Public Entity)	No

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

A.5. Physical/ Geographical boundary of the PoA

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The geographical boundary for this PoA is the Republic of South Africa (Figure 1).
A range of GPS coordinates are given to cover the whole of the RSA:

Geographical latitude: -22 to -35 (Decimal Degrees).
Geographical longitude: 16 to 33 (Decimal Degrees).
Time zone: GMT +02:00

Figure 1: Map showing the Geographical boundaries of the Republic of South Africa (RSA)

A.6. Technologies/measures

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The project activity will apply the following methodology:

- AMS-III.H 'Methane Recovery in Wastewater Treatment' Version 16 (and subsequent versions), under Type III (other project activities), Sectoral Scope 13 – Waste Handling and Disposal.

Additional emission reductions may also be claimed under Type I (renewable energy projects) through the application of AMS-I.C 'Thermal Energy Production With or Without Electricity', Sectoral Scope 1 – Energy Industries (renewable/non-renewable sources).

Prior to the implementation of the project activity, the pre-existing scenario is the disposal of WWTW sludge and organic waste streams to anaerobic lagoon with the concomitant uncontrolled release of methane gas to the atmosphere. This is also the baseline scenario, in which there will only be the piping of wastewater into a lagoon in which the sewage will degrade anaerobically to produce methane which is vented into the atmosphere.

The technology and measures to be employed by each CPA will involve:

- Anaerobic digestion of wastewater streams in a controlled environment
- Subsequent collection and combustion of the biogas produced
- The biogas may be simply flared and/or used to produce heat and/or electricity

- The effluent will be composted, or treated thermally (with heat produced via the combustion of biogas)

A typical 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 processes or electricity generation. In this way, via the destruction of methane, GHG emissions will be reduced.

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 pelletisation plant to produce fertiliser pellets.

The measures are to be employed by each CPA to treat the wastewater and then collect and combust the produced are typically:

- Primary Sludge gravity thickener;
- Secondary Sludge dissolved air flotation thickener;
- Thickening centrifuge;
- Sealed digesters operated under mesophilic conditions
- Dewatering centrifuges;
- Sludge drying.

There is also a tailored control system which runs over the plant and the digesters.

The methane gas will then be captured allowing minimal leakage and stored in a fixed volume or fixed pressure gas storage vessel.

Measures involved in gas management and combustion will include:

Once the biogas has been captured, it will subsequently be combusted within the project boundary in one of the following manners:

- Flaring in a standard enclosed flare

- Used for thermal energy on site:
    - Pipework to transport collected gas to either
        - Gas boilers, in which case, gas boilers will be present
        - A thermal trying plant, in which case, there will be a kiln drying unit with all ancillary equipment

- Used for combined heat and power generation, which will include the equipment for thermal, as well as:
    - Purpose built biogas engines and electrical generators;
    - Transformer equipment (if required) and switchgear equipment necessary to connect to the electrical grid supply network; and
    - An enclosed flare to destroy any residual gas not used for electricity generation

All biogas technology employed shall be in accordance with the requirements of the National Environmental Management: Waste Act 59 of 2008 (NEM:WA) and the site Waste Management

Licence. Each CPA site will be provided with an enclosed biogas flaring system which will be used to combust any gas which cannot otherwise be used to generate electricity or produce heat for beneficial use

A.7. Public funding of PoA

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The City of Cape Town declare that no public funding or Official Development Assistance (ODA) has been diverted in this project as stated in their letter relating to voluntary action and subsequent letter relating to ODA and duty to notify upon discovery

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 Republic South Africa (RSA) regarding the AD of wastewater or other organic waste streams, therefore such projects would not be implemented in the absence of the PoA; and
- Prevailing practice in the RSA is for wastewater sludges and organic waste streams to be deposited in lagoon, landfills or dumpsites. This is the current situation in the Western Cape at least.

Therefore, in the absence of this strategic PoA, there may be many potential projects which would not be implemented. The CME will use the PoA to facilitate the implementation of Anaerobic Digestion at waste water treatment works throughout the project boundary. 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", EB 70 Annex 05. (Version 02.1), eligibility criteria to be considered prior to enrolling each CPA under the proposed PoA will cover as a minimum the following conditions set out in the table below:

Requirement		Evaluation Criteria	Method of Evaluation
1	The geographical boundary	The geographical boundary of the CPA falls within the geographical boundary of South Africa and is therefore consistent with the geographical boundary of the PoA	The CME shall check the GPS co-ordinates of the site provided in Section A.7 of the CPA-DD. **CME signoff only**
2	Start date	The starting date of the CPA shall be earliest date at which the project implementation begins, which shall be determined based on either: - the first signed major	The CME shall check the start date of the CPA in Section A.8.1.of the CPA-DD and ensure that it is after Global Stakeholder Consultation Process of the PoA **Evidence required from CPA**

		contract related to the CPA, or - The first combustion of biogas	**implementer for CME signoff**
3	Avoidance of double counting of emission reductions	Confirm that the CPA is not registered for any other CDM activity	The CME will check with the UNFCCC CDM database to ensure that the CPA is not registered or under consideration for any other CDM activity. **CME signoff only**
4	Specification of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	This programme is specifically for the anaerobic digestion of wastewater streams to produce biogas in a controlled environment which will be flared or beneficially utilized.	The CME will verify the technology by purchase agreement (or similar) document to ensure that it is in accordance with the PoA, Section A.6. **For Flaring: Equipment specification that the flare used is a closed flare** **For Thermal Use: Equipment specification for boiler/kiln** **For CHP: That needed for thermal, as well as equipment specification for gas engine and (where necessary) switchgear**
5	Small Scale Threshold and Debundling	Check that the CERs do not exceed 60,000 p.a. and also that large scale projects have not been de-bundled into many smaller ones.	The CME to confirm that they have checked the anticipated CERs and that it is below 60,000 p.a. CME to confirm that the project is not a large-scale venture debubled into smaller projects **CME signoff only**
6	Compliance with applicability and requirements of single or multiple methodologies	Confirmation that either: • Only AMS-III.H is used; or • AMS-III.H is used in combination with AMS-I.C; only	CME to confirm that only AMS-III.H is used or AMS-III.H is used in combination with AMS-I.C only. To be signed off in a letter/checklist. **CME signoff only** Purchase order (or similar) to be provided by the CPA implementer

			Evidence required by the CPA implementer for CME signoff
7	Additionality	Additionality shall be in accordance with Methodological tool: "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", EB 70 Annex 05. (Version 02.1), Additionally will be demonstrated individually by the CPA according to the procedures described in the Section B.1 of this PoA-DD. The tool requires the following: 1. Confirmation that Anaerobic digestion followed by capture and destruction of biogas is not required by law or mandate 2. Confirmation of a positive IRR results from a financial analysis or basic costs calculation.	1. The CME to check the laws and statutes surrounding the CPA activity to and confirm and sign off in report, official letter or checklist **CME signoff only** 2. The Excel tool standard provided by the CME will be used. The CME will verify the Financial Spreadsheet, and sign off in a checklist **CME signoff only**
8	Local stakeholder consultation	A local stakeholder consultation must be undertaken	A stakeholder consultation report must be completed at the CPA level (by the CPA implementer) for each CPA. The report must include • photocopy of the newspaper advert where the invitation was published; • or copies of the invitation sent to local stakeholders;

			and • the minutes of the meeting and list of attendants; and • Brief description how comments were invited and complied; and • Summary of comments received* • Report on how due account was taken of any comments received **Evidence required from CPA implementer for CME signoff** • ***CME to note how CDM related comments have been addressed***
9	Environmental analysis	Environmental impact analysis including any transboundary impacts shall have been undertaken	Compliance with National Environmental Management Act for project activities. A basic environmental assessment is required for each CPA included under the PoA as per Environmental Impact Assessment Regulations (GN 385, 2006), which is currently under revision. As long as the National Environmental Management Act (NEMA) is still under revision, each CPA will only need at least, a Basic Assessment of Environmental Impacts. Evidence will be EITHER: in the form of a Basic Assessment Report and reference showing that a full EIA is not required, OR: a full EIA **Evidence required by CPA implementer for CME signoff**
10	Funding from Annex 1 parties	No official Development Aid will be involved or diverted as a result of activities under the CPA. The official declarations of 'no development aid' have been provided by the project	Signed declaration from the Project developer of the CPA and the concerned agency in Annex 1 country (if involved)

		developers. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted	**Evidence required by the CPA implementer for signoff by the CME**
11	Legal compliance	Compliance with South African waste legislation. This includes: Proof of ownership and/or permit to operate the WWTW	A permit for disposal is required by the CPA implementer to show that the site is licensed **Evidence required by the CPA implementer for CME signoff**
12	Revenue from CERs	Agreement of revenue of CERs from	The CME and CPA implementer will duly both sign an agreement denoting which party will receive the revenue from the CERs **Evidence required for CME signoff**

B.3. Application of methodologies

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

Either:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16);

Or the approved combination of:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16); and
- Simplified baseline and monitoring methodology AMS-I.C 'Thermal Energy Production With or Without Electricity' (Version 19).

Along with all associated tools and guidance. The tools applicable to AMS-III.H are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Emissions From Solid Waste Disposal Sites' (Version 06.0.1);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Project Emissions From Flaring' (Version 02.0.0);

The tools relevant to AMS.I-C (when applicable) are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);

- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

Each CPA implemented under this PoA will anaerobically digest wastewater in a controlled environment to recover biogas which will either be flared or utilized in onsite heat or CHP in accordance with the technologies outlined in Section A.6

SECTION C. Management system

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Roles and Responsibilities

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 will 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 will be responsible for the implementation, management and monitoring of the AD plant and operations, the biogas handling and utlisation, and the effluent management.

The proposed PoA involves a range of operational activities which will be required to successfully implement and manage each CPA. As the CME, the city of Cape Town will be responsible for the management and record keeping of each CPA. However, the a project developer, which may either be:

- the City of Cape Town alone,
- the City of Cape Town in association with a 3rd party
- A third party alone in the Cape Town municipality
- A third party through association with another municipality in the Republic of South Africa

In the latter three cases, 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 and wastewater management who may in the future contract with the City of Cape Town or such third parties to include their activities in the PoA.

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

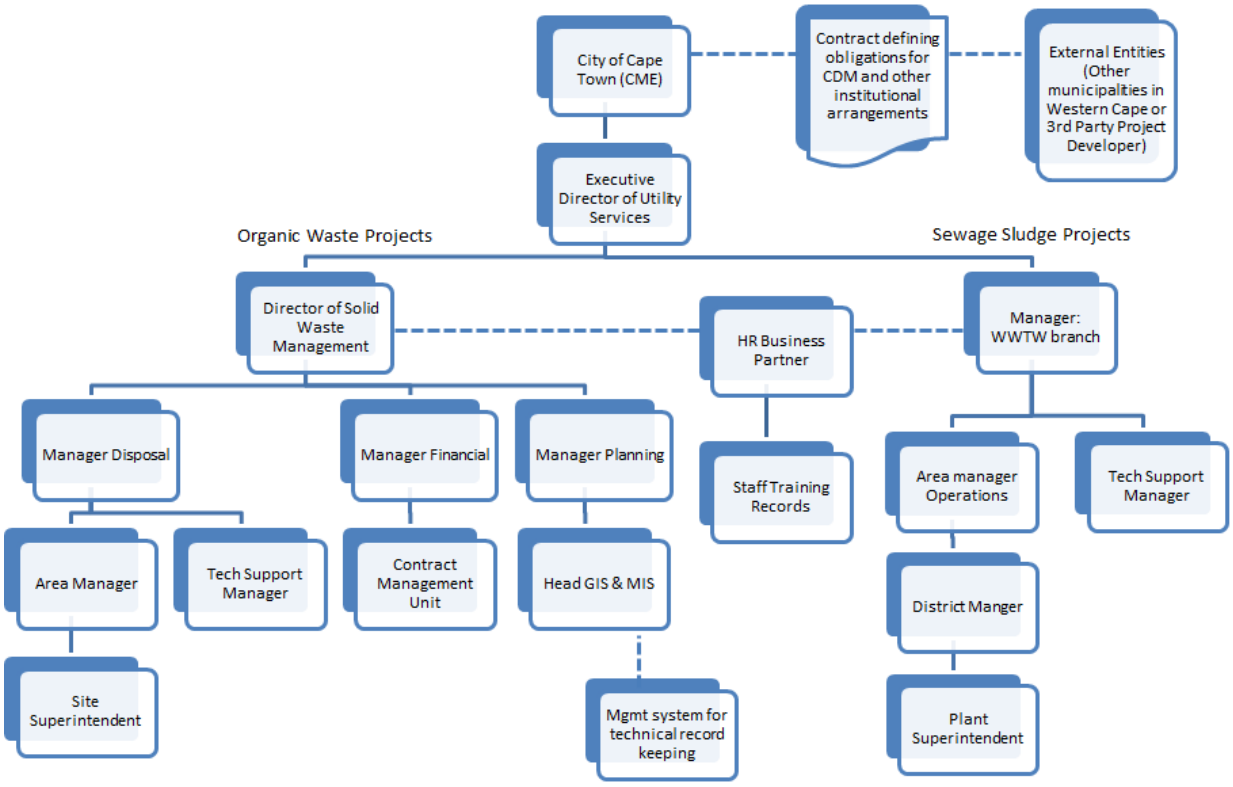
For each CPA, there will be a detailed monitoring plan and system of electronic data management (which will be automated where practicable) in place prior to the commencement of the first crediting period. Each site will have its own installed data capture systems which will be accessible to the verifying 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. Roles and responsibilities will be arranged for each CPA under guidance from the CME manual.

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 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 will further include procedures for the review of technology or measures to be employed by the CPA to ensure the CPA complies with this PoA. A sampling approach will be used for all future CPAs and is outlined in the Management Manual. The procedures are outlined as follows:

CDM Projects in the Cape Town Municipal Jurisdiction Area

The registration with the UNFCCC of CDM projects for the City's Treatment of Organic Wastes programme of activities is a precursor to the final work necessary to assess the funding, viability, institutional arrangements and risks of projects. The realisation of CDM revenue will be an important consideration when generating the business cases that will be used to determine the financial viability of projects aimed at climate mitigation. Due to the known large requirements for capital to develop and

implement these types of projects, the procurement mechanism to be used is very likely to be that of a Public Private Partnership (PPP). These types of projects' objectives are to generate project capital, and share risk and reward fairly, by engaging a third party as a partner to provide resources and specialist skills into the project.
For PPPs, a Service Delivery Agreement (SDA) will be structured to manage the arising long-term contractual arrangement that will be necessary to develop, manage, maintain and repair infrastructure, to record, manage and protect data integrity, coordinate and report on activities and emission reductions, and to ensure that all persons involved in the process are trained according to the UNFCCC rules governing the CDM process.
The City will establish a contract monitoring unit (CMU), as required in terms of the Municipal Finance Management Act's Municipal PPP Regulations, to monitor, evaluate and correct performance on the contracts, as well as to receive data and report for CDM purposes. The CMU will be responsible for the monitoring and evaluation of performance of PPP contracts, as well as receiving CDM-related data and reports from external participants in the PoA, which will be necessary to comply with UNFCCC requirements.
Alternatively, if the Council of the CoCT deems it viable to fund the capital (and, thus, not establish a PPP), a third party will be contracted via a long-term Council contract with similar terms and conditions, since the operating viability is still dependent on specialist skills and resources that will be contracted in to ensure the integrity of the process due to the linked revenue implications. .

Terms and Conditions of CoCT SDAs or Contracts in respect of 3rd Party Roles and Responsibilities
The viability of projects and the appropriate institutional and contractual arrangement will be assessed through the PPP TA project. The terms and conditions of the contracts arising from this process will be informed by the requirements of the UNFCCC. Estimates and information that have already been generated per the carbon emissions modelling calculations received from the CDM consultant employed by the CoCT for the project registration process, will likewise inform these contractual arrangements.

Other CDM Projects in the Republic of South Africa outside the City of Cape Town municipal area
As the City of Cape Town Treatment of Organic Waste POA's geographic boundary has been defined to span the Republic of South Africa, municipalities other than the CoCT, and private sector waste management companies that are responsible for other potential CPA sites in the province, will be able to register projects under the PoA.
A strict contractual relationship will be used to determine responsibilities of such entities, especially for financial (cost and revenue), local management of infrastructure and data and for reporting obligations.
In principle, when a new CPA needs to be registered, the CME (CoCT) will:

1. Proceed to contact the UNFCCC EB and the SA DNA to determine whether a project has already been registered.
2. If not registered, confirm with the applying entity, who will then be obliged to sign a legal agreement that will spell out the specifics this entity will be responsible and accountable for.
3. Establish that each CPA under the TOW PoA will comprise the controlled anaerobic digestion of waste streams to produce biogas which will subsequently be combusted via a combination of flaring and use for either electricity generation or as a source of heat.
4. Determine whether the entity has the necessary skills and resources available, either through an internal or through an externally contracted institutional arrangement (which includes verification activities) to:
    a. Develop a project from concept to design and procurement stage;
    b. Implement and commission the TOW project for the extraction and collection, flaring, reticulation, control, instrumentation, data measurement and collection equipment and infrastructure;
    c. Operate, maintain and repair equipment and infrastructure;
    d. Monitor, collect, store, back-up, transfer or transmit data;

e. Generate information for reporting and transmission of reports related to emissions, destruction of carbon, equipment availability and use (run time), costs
f. Verify data, in order to comply with UNFCCC EB requirements.

5. If there are deficiencies, advise the entity how these can be overcome, to ensure that a project's outcomes will be compliant and eligible for registration under the CoCT TOW PoA.

Where possible, assist the applying entity to conform.

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 via contract stipulations as described in Section A.2 . 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 will be recorded.

System for Data Measurement, Capturing, Storage, Monitoring and Reporting

The system to ensure the validity and integrity of data will be implemented using standard processes and procedures. Standard operating Procedures will be developed along the lines of an ISO system. Generally the data management system will consist of:

- Measuring, control and monitoring instruments (typically found in continuous process plants in the oil and gas industry, e.g. gas flow, volume, density, pressure, temperature and emissions measurement).
- On-site information system consisting of hardware and software to store, back-up, duplicate/replicate and transmit electronic data.
- Remote data storage and transmission system for disaster management purposes.
- If electrical power is generated, power generation and control instruments, including timing equipment to show equipment (generator set) run time as a means of predictive maintenance to keep plant and equipment in an optimal state of operation and availability.

The technical applications in mind for the alternative treatment of waste streams means that gas flow meters and related instrumentation will be required to measure and register the amount of GHGs that will flow from extraction points via a reticulation system to the destruction equipment. Additional metering equipment may be necessary to determine the amount destroyed and to monitor flare emissions.
If power is generated, it will also be important to measure power output, which will also be a possible revenue stream that will rather feature as a cost saving, as it is the CoCT's intention to use the power on-site, meaning that it will offset the bulk power purchased from the primary electrical grid network.
All meters will be connected to an electronic data capturing system, which will have off-site storage and back-up capacity to ensure continuity of data. Data and reports will be provided to the CoCT (the CME) in electronic format or hardcopy or both.
By virtue of being responsible for public administration records as a municipality in terms of various South African municipal, records and finance management statutes, the CoCT has the necessary information systems and technology in place, will start with appointments of the trained staff to administer data, information and reports. It administers mission critical data (such as accounting and financial information, staff records, etc) by using an Enterprise Resource Platform, e.g. SAP.

For CoCT-owned projects, the cost information related to CoCT operations, repairs and maintenance will be captured, stored and produced via the SAP system. If it is a third party owned project, information will have to be provided by report that could be provided electronically or in hardcopy.
Other information systems are in use, on the Microsoft platform, such as Sharepoint. Training is provided to members of staff involved in administration, information management and reporting from time to time with system improvements and additions.
The CME will report to the UNFCCC Executive Board (EB) as required, in conjunction with the DOE once the verification of data is complete.

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 of Cape Town 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, another local authority or a third party project implementer within the Republic of South Africa. 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

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.

South African laws/regulations require for each CPA a basic (environmental) assessment in accordance with the National Environmental Management Act (NEMA) No 62 of 2008 (NEMA –G31789), the National Environmental Management: Waste Act (NEM:WA) No 59 of 2008 (NEM:WA-G32000) and the Environmental Laws Amendment Act No 14 of 2009 (NEMA-G32267) and . Where applicable and necessary, as described by the abovementioned Acts, a full EIA will be carried out

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA - Flaring

A.1. Purpose and general description of generic CPAs

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This Component Project Activity (CPA) details the treatment of wastewater by way of anaerobic digestion at Site X. These wastewater sludges constitute typically primary (PS) and waste activated sludges (WAS). The biogas that is produced will be used on site and any excess will be flared.

Certified Emission Reductions (CERs) will be claimed for the small scale anaerobic digestion of sludge, using AMS-III.H and where applicable the displacement of fossil fuels with the combustion of biogas, using AMS-I.C.

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 will apply the following approved baseline and monitoring methodology:

- Simplified baseline and monitoring methodology AMS-III.H ‘Methane Recovery in Wastewater Treatment (Version 16);

The CPA will apply the following approved combination of baseline and monitoring methodologies:

- Simplified baseline and monitoring methodology AMS-III.H ‘Methane Recovery in Wastewater Treatment (Version 16); and
- Simplified baseline and monitoring methodology AMS-I.C ‘Thermal Energy Production With or Without Electricity’ (Version 19).

Along with all associated tools and guidance. The tools applicable to AMS-III.H are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Emissions From Solid Waste Disposal Sites' (Version 06.0.1);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Project Emissions From Flaring' (Version 02.0.0);

The tools relevant to AMS.I-C (when applicable) are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

Subsequent versions will be used where the above are superseded

B.2. Application of methodology(ies)

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The following table presents the application of the respective methodologies for a generic CPA whereby biogas is captured and used for the generation of thermal energy (AMS-III.H with the possibility of AMS-I.C). If applicability criteria referenced in the methodology are not included in the table below, it is considered that they will not be applicable to any potential CPA to be implemented under this PoA.

Applicability Criterion	Comment	Reference
Applicability of AMS-III.H		
AMS-III.H Version 16 comprises measures that recover biogas from biogenic biomass matter in wastewater by means of one, or a combination, of the following options: (a) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (b) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (c) Introduction of biogas recovery and combustion to a sludge treatment system; (d) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an onsite industrial plant; (e) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic	The CPA will involve recovery of biogas from biogenic biomass matter by means of one, or a combination of, the options listed in the methodology.	AMS-III.H Version 16 Paragraph 1

sludge treatment, to an untreated wastewater stream; (f) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).		
In cases where baseline system is anaerobic lagoon the methodology is applicable if: (a) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (b) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (c) The minimum interval between two consecutive sludge removal events shall be 30 days.	If applicable to the specific CPA, evidence will be provided in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 2
The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or mechanical, electrical energy generation directly; (b) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution: (i) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (iii) Upgrading and transportation of biogas (e.g. by	The CPA will utilise recovered biogas for renewable energy production directly (3a)	AMS-III.H Version 16 Paragraph 3

trucks) to distribution points for end users. (d) Hydrogen production; (e) Use as fuel in transportation applications after upgrading.		
If the recovered biogas is used for project activities covered under paragraph 3 (a), that component of the project activity can use a corresponding methodology under Type I.	The CPA may also use corresponding methodology AMS-I.C if applicable.	AMS-III.H Version 16 Paragraph 4
New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	For CPAs which will be implemented under these circumstances, the respective guidance and methodology requirements will be adhered to.	AMS-III.H Version 16 Paragraph 12
The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	Each CPA will be identified by an address location and GPS coordinates for the treatment plant site and a description of the source(s) generating the wastewater.	AMS-III.H Version 16 Paragraph 13
Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	CPAs will only be included if they satisfy the requirement of generating less than 60kt CO_2 equivalent annually. This will be clearly documented in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 14
Applicability of AMS-I.C		
Biomass-based cogeneration systems are included in this category. For the purpose of this methodology "cogeneration" shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example heat from a boiler and electricity from a biogas engine) do not fit under the definition of cogeneration project.	If applicable, the CPA will only apply one process for the simultaneous generation of thermal energy and electrical energy.	AMS-I.C Paragraph 2
Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (a) Electricity supply to a grid; (b) Electricity and/or thermal energy (steam or heat) production for on-site	One of the three scenarios will be applicable to each CPA and will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 3

consumption or for consumption by other facilities; (c) Combination of (a) and (b).		
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	Each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 4
For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 5
The following capacity limits apply for biomass cogeneration units: (a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 6
The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities	Where applicable, each CPA will comply with this requirement and	AMS-I.C Paragraph 7

that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct from the existing units.	compliance will be clearly documented in the respective CPA-DD.	
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	If such conditions are applicable to the CPA, this will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 8
New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies".	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 9
Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 11
If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 12
If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand-alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 13

A sampling approach will not be applied, each CPA will be independently validated and verified

B.3. Sources and GHGs

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Source		GHGs	Included?	Justification/Explanation
Baseline	Direct emissions from the wastewater treatment process	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification

	Emissions from electrical energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project Scenario	Biogas Recovery System	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Additional Electricity Use	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Generation of Electricity	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Combustion of biogas for thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

B.4. Description of baseline scenario

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The baseline for the generic CPA is the continued operation of the wastewater plant without anaerobic digestion and disposal of waste to anaerobic lagoon or similar SWDS

B.5. Demonstration of eligibility for a generic CPA

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	Requirement	Evaluation Criteria	Method of Evaluation
1	The geographical boundary	The geographical boundary of the CPA falls within the geographical boundary of South Africa and is therefore consistent with the geographical boundary of the PoA	**CME signoff only**
2	Start date	The starting date of the CPA shall be earliest date at which the project implementation begins, which shall be determined based on either: - the first signed major contract related to the CPA, or - The first combustion of biogas	**Evidence**
3	Avoidance of double counting of emission reductions	Confirm that the CPA is not registered for any other CDM activity	**CME signoff only**

4	Specification of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	This programme is specifically for the anaerobic digestion of wastewater streams to produce biogas in a controlled environment which will be flared or beneficially utilized.	**For Flaring: Equipment specification that the flare used is a closed flare**
5	Small Scale Threshold and Debundling	Check that the CERs do not exceed 60,000 p.a. and also that large scale projects have not been de-bundled into many smaller ones.	**CME signoff only**
6	Compliance with applicability and requirements of single or multiple methodologies	Confirmation that either: • Only AMS-III.H is used; or • AMS-III.H is used in combination with AMS-I.C; only	**CME signoff only**
7	Additionality	Additionality shall be in accordance with Methodological tool: "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", EB 70 Annex 05. (Version 02.1), Additionally will be demonstrated individually by the CPA according to the procedures described in the Section B.1 of this PoA-DD. The tool requires the following: 2. Confirmation that Anaerobic digestion followed by capture and destruction of biogas is not required by law or mandate	**CME signoff only**

		3. Confirmation of a positive IRR results from a financial analysis or basic costs calculation.	**CME signoff only**
8	Local stakeholder consultation	A local stakeholder consultation must be undertaken	**Evidence**
9	Environmental analysis	Environmental impact analysis including any transboundary impacts shall have been undertaken	**Evidence**
10	Funding from Annex 1 parties	No official Development Aid will be involved or diverted as a result of activities under the CPA. The official declarations of 'no development aid' have been provided by the project developers. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted	**Evidence**
11	Legal compliance	Compliance with South African waste legislation. This includes: Proof of ownership and/or permit to operate the WWTW	**Evidence**
12	Revenue from CERs	Agreement of revenue of CERs from	**Evidence**

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

B.6.1. Explanation of methodological choices

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This methodology addresses project activities where the organic matter present in wastewater streams, originally intended for disposal, is treated via anaerobic digestion. The CPA avoids methane emissions from wastewater in an anaerobic lagoon where methane emissions are naturally vented into the atmosphere. The GHGs involved in the baseline and project activity are CO_2 and CH_4.

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

Emissions reductions calculations are shown in section B.6.3

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

Applicability of methodological tool "Tool to calculate Project or Leakage CO2 emissions from fossil fuel combustion"

Over the site of the project activity, there may be fossil fuel combustion. Where there is, this tool will be employed to calculate the associated emissions, and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of Methodological tool "Emissions from solid waste disposal sites" (Version 06.0.1)

The tool is applicable to the POA under Application B: the CDM project activity avoids or involves the disposal of waste in an anaerobic lagoon or SWDS. This tool will be used where the CPA involves the treatment of wastewater with an alternative option, in this case, anaerobic digestion and thus it is not disposed of. The tool will be applied separately for each type of waste stream.

Applicability of methodological tool "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (Version 01)

Some equipment on site will use electricity. In such cases, this tool will be utilized to calculate the associated emissions from electricity consumption (especially considering that the RSA is largely dependent on coal as an electricity source), and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of methodological tool "Project emissions from flaring (Version 02.0.0)

Any GHG which is flared will need to be measured, and quantified. The destruction of that gas will further have an efficiency which will dictate the relevant emissions reductions.

Applicaibility of 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

If the biogas is beneficially utilized to produce heat or electricity, then this tool will be employed where relevant to calculate parameters from which emissions reductions will be determined

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

Baseline Emissions Calculations

Data / Parameter	ID**xx** - $BE_{s,treatment,y}$
Unit	tCO2e
Description	Baseline emissions of the sludge treatment systems affected by the project activity in year y
Source of data	Calculated
Value(s) applied	-
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - $S_{j,BL,y}$
Unit	t
Description	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario
Source of data	Sum Cape Flats sludge types, refer to the Calculation Spreadsheet Provided
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - j
Unit	-
Description	Number of types of sludge present and used in the calculations
Source of data	measured
Value(s) applied	5
Choice of data or Measurement methods and procedures	There are 5 types of sludge
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - DOC_s
Unit	-
Description	Degradable organic content of the untreated sludge generated in the year y
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	

Data / Parameter	ID xx - $MCF_{s,treatment,BL,J}$
Unit	-
Description	Methane correction factor for the baseline sludge treatment system j
Source of data	IPCC default values for MCF
Value(s) applied	0.8
Choice of data or Measurement methods and procedures	(MCF values as per Table III.H.1)
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - UF_{BL}
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	IPCC
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx -DOC_F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - F
Unit	-
Description	Fraction of CH4 in biogas
Source of data	IPCC
Value(s) applied	0.5

Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - GWP_{CH4}
Unit	-
Description	Global Warming Potential of methane
Source of data	IPCC
Value(s) applied	21
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Project Activity Emissions Calculations

Data / Parameter	ID xx - $EC_{PJ,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Measured by electricity meter for equipment on site
Purpose of data	Project activity emissions from power
Additional comment	Calculated from information from COCT WW Dept.

Data / Parameter	ID xx - $EF_{EL,j,y}$
Unit	tCO2/MWh
Description	Emission factor for electricity generation for source j in year y
Source of data	Default value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Used default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $TD_{Lj,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	IPCC
Value(s) applied	0
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,ww,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y
Source of data	measured/assumed
Value(s) applied	0
Choice of data or Measurement methods and procedures	WWTW not applicable
Purpose of data	Fugitive emissions calculations
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,s,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Chosen to calculate instead of using the default value
Purpose of data	Fugitive emissions calculations
Additional comment	Conversely the IPCC default value of 0.05m3 biogas leaked per m3 biogas produced renders 5,220. This value can be given the default value but ID xx to ID xx are used in its calculation

Data / Parameter	ID xx - ***CFEs***
Unit	-
Description	Capture efficiency of the biogas recovery equipment in the sludge treatment system
Source of data	AMS-III.H
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	AMS-III-H default value
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	-

Data / Parameter	ID xx - $MEP_{s,treatment,y}$
Unit	t
Description	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from ID xx – ID xx

Data / Parameter	ID xx - $S_{l,PJ,y}$
Unit	t
Description	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y
Source of data	Sum of five different sludge types
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from data provided by the CoCT

AMS I.C Parameters
Baseline Emissions Calculation

Data / Parameter	IDxx - $EG_{thermal,y}$
Unit	TJ
Description	The net quantity of steam/heat supplied by the project activity during the year y
Source of data	Calculated/measured
Value(s) applied	XX
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Calculated by SLR based on xx l/hr of fuel

Data / Parameter	IDxx - $\eta_{BL,thermal}$
Unit	-
Description	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
Source of data	Assumed
Value(s) applied	Default value
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Assumption will be justified on the CPA

Data / Parameter	ID<u>xx</u> - $EF_{FF,CO2}$
Unit	tCO2/TJ
Description	The CO2 emission factor of the fossil fuel that would have been used in the baseline plan
Source of data	IPCC
Value(s) applied	<u>xx</u>
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline emissions calculation
Additional comment	Will depend on the fossil fuel used

Project Activity Emissions Calculation

Data / Parameter	ID<u>xx</u> - $PE_{s,y}$
Unit	tCO_2
Description	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y
Source of data	N/A
Value(s) applied	0
Choice of data or Measurement methods and procedures	Not applicable in this instance
Purpose of data	Project activity emissions calculation
Additional comment	-

Data / Parameter	ID<u>xx</u> - $PE_{FF,y}$
Unit	tCO_2
Description	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y
Source of data	Calculated
Value(s) applied	Equal to $PE_{FC,j,y}$
Choice of data or Measurement methods and procedures	-
Purpose of data	Project activity emissions calculation
Additional comment	Equal to $PE_{FC,j,y}$

Data / Parameter	ID**xx** - $PE_{FC,j,y}$
Unit	tCO_2
Description	CO2 emissions from fossil fuel combustion in process j during the year
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Amount of fossil fuel used.
Purpose of data	Project activity emissions calculation
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

>>

The emissions reductions will be calculated according to the following formulae. The baseline emissions and project activity emissions are outlined for each methodology AMS-III.H and AMS-I.C individually. The formulae to calculate the leakage and the emissions reduction for all methodologies are the same and are therefore shown once at the end.

Formulae for AMS-III.H

Baseline Emissions for AMS-III

Baseline Emissions (AMS-III.H)	
$BE_y = BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}$	
Term	**Description**
BE_y	Baseline emissions in year y (tCO_2e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO_2e)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO_2e)
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO_2e)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)

$BE_{s,treatment,y} = \sum S_{j,BL,y} * MCF_{s,treatment,BL,J} * DOC_s * UF_{BL} * DOC_f * F * 16/12 * GWP_{CH4}$	
Term	**Description**
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario (t)
j	Index for baseline sludge treatment system
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
$MCF_{s,treatment,BL,J}$	Methane correction factor for the baseline sludge treatment system j (MCF values as per Table III.H.1)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

$BE_{s,final,y} = \sum S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_f * F * 16/12 * GWP_{CH4}$	
Term	**Description**
$BE_{s,final,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$MCF_{s,BL,final}$	Methane correction factor for the baseline sludge treatment system (Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

Project Activity Emissions for AMS-III.H

Project Activity Emissions (AMS-III.H)

$$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y}$$

Term	Description
PE_y	Project activity emissions in the year y (tCO_2e)
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year y (tCO_2e).
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e)
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO_2e)
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y (tCO_2e)

$$PE_{power,y} = PE_{EC,y} = \sum EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$$

Term	Description
$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$	
Term	**Description**
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO2e)
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y (tCO_2e)
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)

$PE_{fugitive,s,y} = (1 - CFE_s) * MEP_{s,treatment,y} * GWP_{CH4}$	
Term	**Description**
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)
CFE_s	Capture efficiency of the biogas recovery equipment in the sludge treatment systems (a default value of 0.9 shall be used)
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
GWP_{CH4}	IPCC standard value
$MEP_{s,treatment,y} = \sum (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$	
Term	**Description**
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
$S_{l,PJ,y}$	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y (t)
$MCF_{s,treatment,PJ,l}$	Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (MCF values as per Table III.H.1)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)

$PE_{flaring,y} = TM_{flared,y} * (1 - \eta_{flare,y}) * GWP_{CH4}$	
Term	**Description**
$PE_{flaring,y}$	Methane emissions due to incomplete flaring (tCO2e/yr)
$TM_{flared,y}$	Mass flow rate of methane flared in dry basis in the hour, h (tCH4/yr)
$\eta_{flare,y}$	Flare efficiency in hour, h based on default values
GWP_{CH4}	Global warming potential of methane

Additional formulae to be used if type I methodology AMS-I.C is included

Baseline Emissions for AMS-I.C

Baseline Emissions (AMS-I-C)	
$BE_{thermal,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$	
Term	**Description**
$BE_{thermal,CO2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year y (TJ)
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant (tCO_2/TJ)

Project Activity Emissions for AMS-I.C

Project Activity Emissions (AMS-I.C)	
$PE_{Geo,y} = PE_{s,y} + PE_{FF,y}$	
Term	**Description**
$PE_{Geo,y}$	Project emissions in year y (tCO_2/y)
$PE_{s,y}$	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO_2)
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2)
$PE_{FF,y} = PE_{FC,j,y}$	
Term	**Description**
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO2)
$PE_{FC,j,y}$	CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2)

For both methodologies

Leakage calculated for AMS-III.H and AMS-I.C

Leakage Emissions	
LE_y = *Estimated*	
Term	**Description**
LE_y	If the technology is using equipment transferred from another activity, leakage effects at the site of the other activity are to be considered and estimated (LE_y)

Emissions Reductions for AMS-III.H and AMS-I.C

Emission Reductions	
$ER_{y,ex\ ante} = BE_{y,ex\ ante} - (PE_{y,ex\ ante} + LE_{y,ex\ ante})$	
Term	**Description**
$ER_{y,ex\ ante}$	Ex ante emission reduction in year y (tCO_2e)
$BE_{y,ex\ ante}$	Ex ante baseline emissions in year y (tCO_2e)
$PE_{y,ex\ ante}$	Ex ante project emissions in year y (tCO_2e)
$LE_{y,ex\ ante}$	Ex ante leakage emissions in year y (tCO_2e)

A summary of emissions reductions is therefore presented as follows

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1: 2013	xx	xx	xx	xx
Year 2: 2014	xx	xx	xx	xx
Year 3: 2015	xx	xx	xx	xx
Year 4: 2016	xx	xx	xx	xx
Year 5: 2017	xx	xx	xx	xx
Year 6: 2018	xx	xx	xx	xx
Year 7: 2019	xx	xx	xx	xx
Total	xx	xx	xx	xx
Total number of crediting years	xx			
Annual average over the crediting period	xx	xx	xx	xx

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

As per AMS-III.H

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m³/month
Description:	The flow of wastewater
Source of data:	Measured
Measurement procedures (if any):	Measurements are undertaken using flow meters
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	-
Any comment:	

Data / Parameter:	$COD_{ww,untreated,y}$, $COD_{ww,treated,y}$, $COD_{ww,discharge,PJ,y}$
Data unit:	t COD/m³
Description:	The chemical oxygen demand of the wastewater before and after the treatment system affected by the project activity
Source of data:	Measured
Measurement procedures (if any):	Measure the COD according to national or international standards. COD is measured through representative sampling
Monitoring frequency:	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures:	

Any comment:	

Data / Parameter:	$S_{l,PJ,y}$, $S_{final,PJ,y,}$
Data unit:	t
Description:	Amount of dry matter in the sludge
Source of data:	Measured
Measurement procedures (if any):	Measure the total quantity of sludge on a wet basis. The volume (m^3) and density or direct weighing may be used to determine the sludge amount (wet basis). Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis. If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period. If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE
Monitoring frequency:	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level
QA/QC procedures:	
Any comment:	

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3
Description:	Biogas volume in year *y*
Source of data:	Measured
Measurement procedures (if any):	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network) shall be monitored *ex post*, using continuous flow meters. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions can be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before the separation. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	
Any comment:	

Data / Parameter:	$w_{CH4,y}$
Data unit:	%
Description:	Methane content in biogas in the year *y*
Source of data:	

Measurement procedures (if any):	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO_2 is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	
1. QA/QC procedures:	
Any comment:	-

Data / Parameter:	T
Data unit:	^{o}C
Description:	Temperature of the biogas
Source of data:	
Measurement procedures (if any):	The temperature of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	P
Data unit:	Pa
Description:	Pressure of the biogas
Source of data:	
Measurement procedures (if any):	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	η
Data unit:	%
Description:	Parameters related to emissions from electricity and/or fuel consumption in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares

Monitoring frequency:	
QA/QC procedures:	
Any comment:	

As per: "Emissions from Solid Waste Disposal Site"

Data / Parameter:	f_y
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
Source of data:	Select a maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Measurement procedures (if any):	-
Monitoring frequency:	For the application A: Once for the crediting period (f_y – f) For the application B: Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	W_x or W_i
Data unit:	t
Description:	Total amount of waste disposed in a SWDS in year *x* or month *i*
Source of data:	Measurements by project participants
Measurement procedures (if any):	Measure on a wet basis
Monitoring frequency:	Continuously, aggregated at least annually for year *x* or monthly for month *i*
QA/QC procedures:	
Any comment:	For application B

Data / Parameter:	$p_{n,j,x}$ or $p_{n,j,i}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample n collected during the year *x* or month *i*
Source of data:	Sample measurement by project participants
Measurement procedures (if any):	Sample the waste composition, using the waste categories *j*, as provided in the table for DOC_j and k_j, and weight each waste fraction (measure on wet basis)
Monitoring frequency:	Minimum of three samples every three months
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste type *j*. Sampling is not required if the waste comprises only one waste type.

Data / Parameter:	z_x
Data unit:	
Description:	Number of samples collected during year *x*
Source of data:	Project participants
Measurement procedures (if any):	Minimum of three samples every three months
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste category *j*.

Data / Parameter:	d_y
Data unit:	m
Description:	Depth of the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well, that is also used to measure the height of the water table ($h_{w,y}$).
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	$h_{w,y}$
Data unit:	m
Description:	Height of the water table in the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	a,b,c,d,e, g
Data unit:	%
Description:	Effect of the uncertainty of different parameters
Source of data:	Project participants
Measurement	Using the instructions in Table 3 in the methodological tool "Emissions from

procedures (if any):	solid waste disposal sites" (EB66 Annex 46).
Monitoring frequency:	Annually, if the conditions described in the "Instructions for selecting the factor" in table 3 in the methodological tool "Emissions from solid waste disposal sites" (EB66 Annex 46) have changed, (e.g. a change in how the weight of waste is measured). Once for the crediting period, if these conditions do not change.
QA/QC procedures:	-
Any comment:	Used in option 2 for determining the model correction factor.

From the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

Data / parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2/MWh
Description:	Combined margin emission factor for the grid in year *y*
Source of data:	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any):	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency:	As per the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	Only applicable to scenarios A and C (cases C.I and C.III)

Data / parameter:	$TDL_{j,y}$ and $TDL_{k,y}$ and $TDL_{l,y}$
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source *j*, *k* or *l* in year *y*
Source of data:	In case of scenario B and scenario C, case C.II, assume TDLj/k/l,y = 0 as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: • Use recent, accurate and reliable data available within the host country; • Use as default values of 20% for (a) project or leakage electricity consumption sources; (b) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. • Use as default values of 3% for (a) baseline electricity consumption sources; (b) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.

Measurement procedures (if any):	For a): $TDL_{j/k/l,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.
Monitoring frequency:	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures:	
Any comment:	

Data / parameter:	$FC_{n,i,t}$
Data unit:	Mass or (normalized) volume unit per year (in m^3, ton or l)
Description:	Quantity of fossil fuel type *i* fired in the captive power plant *n* in the time period *t*
Source of data:	Annual data during the crediting period: Onsite measurements Historical data: Historical records / onsite measurements
Measurement procedures (if any):	Use weight or volume meters
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	Only applicable if option B1 is used.

Data / Parameter:	$EG_{n,t}$
Data unit:	MWh
Description:	Quantity of electricity generated in captive power plant *n* in the time period *t*
Source of data:	Onsite measurements
Measurement procedures (if any):	Use electricity meters
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	Cross check measurement results with records for sold electricity where relevant
Any comment:	Only applicable if option B1 is used

Data / parameter:	$HG_{n,t}$
Data unit:	GJ
Description:	Quantity of heat co-generated in captive power plant *n* in the period *t*
Source of data:	Onsite measurements
Monitoring frequency:	Use meters
Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot water generated minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.

QA/QC procedures:	Cross check measurement results with records for sold heat and the other energy measurements where relevant.
Any comment:	Only applicable if option B1 is used and if heat generation is not ignored (subject to the conditions outlined above)

Data / parameter:	$\eta_{boiler,y}$
Data unit:	-
Description:	Efficiency of the boiler in which heat is assumed to be generated in the absence
Source of data:	Choose among the following options:
Monitoring frequency:	a) Once at the start of the project activity b) Not applicable
Measurement procedures (if any):	a) Use national or international standards to determine the boiler efficiency b) Not applicable
QA/QC procedures:	-
Any comment:	Only applicable to option B1 and in cases where CO2 emissions from cogeneration are allocated to heat and power

Data / parameter:	NCVi,t	
Data unit:	GJ / mass or volume unit	
Description:	Average net calorific value of fossil fuel type *i* used in the period *t*	
Source of data:	The following data sources may be used if the relevant conditions apply:	
	Data source	**Conditions for using the data source**
	a) Values provided by the fuel supplier in invoices	This is the preferred source
	b) Measurements by the project participants	If a) is not available
	c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy
	d) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall out this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Only applicable if option B1 is used

Data / parameter:	EFCO2,i,t
Data unit:	t CO2 / GJ
Description:	CO2 emission factor of fossil fuel type *i* used in the period *t*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
a) Values provided by the fuel supplier in invoices	This is the preferred source.
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
d) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account

Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, options b), c) or d) should be used.
QA/QC procedures:	
Any comment:	Only applicable if option B1 is used

From the "Tool to calculate project of leakage CO2 emissions from fossil fuel combustion"

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *J* during the year *y*
Source of data:	Onsite measurements
Measurement procedures (if any):	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

Data / Parameter:	$w_{C,i,y}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for Using Data**
a) Values provided by the fuel supplier and invoices	This is the preferred source
b) Measurements	If a) is not available

	by the project participants |
Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used

Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions applu:

Data Source	**Conditions for using the data**
a) Values provided by the fuel supplier	This is the preferred source
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available. These sources can only be used for liquid fuels and should be based on well documents, reliable sources.

Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	
Any comment:	Applicable where Option A is used and where $FC_{i,j,y}$ is measured in a volume unit. Preferably the same data source should be used for $w_{C,i,y}$ and $\rho_{i,y}$.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m^3, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for using the data**

	a) Values provided by the fuel supplier in invoices	This is the preferred source if the carbon fraction of the fuel is not provided (Option A)
	b) Measurements by the project participants	If a) is not available
	c) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
	d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards	
Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account	
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.	
Any comment:	Applicable where Option B is used	

Data / Parameter:	$EF_{CO2,j,y}$	
Data unit:	tCO_2/GJ	
Description:	Weighted average CO_2 emission factor of fuel type *j* in year *y*	
Source of data:	The following data source may be used if the relevant conditions apply:	
	Data Source	**Conditions for using the data source**
	a) Values provided by the fuel supplier in invoices	This is the preferred source
	b) Measurements by the project participants	If a) is not available
	c) Regional or national default	If a) is not available.

	values	This source can only be used for liquid fuels and should be based on well documented reliable sources (such as national energy balances)
	d) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of the Chapter 1 of Vol. 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available.
Measurement procedures (if any):	For a) and b), measurements should be undertaken in line with the national or international fuel standards.	
Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually	
QA/QC procedures:		
Any comment:	Applicable where option B is used. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, Options b), c) or d) should be used.	

Where applicable, AMS.I-C parameters to be monitored.

Data / Parameter:	
Data unit:	
Description:	Continuous operation of the equipment/ system
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance
QA/QC procedures:	
Any comment:	If the emissions reduction per system is less than five tonnes of CO_2e a year; or In the case of household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible: (i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute), if necessary using survey methods;

	(ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available. Where necessary refer to the "General guidelines for sampling and surveys for SSC project activities"

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2e/kWh
Description:	CO_2 emission factor for the grid electricity in year *y*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2e/GJ
Description:	CO_2 emission factor of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"

Data / Parameter:	
Data unit:	MWh
Description:	Quantity of electricity generated/ supplied
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". In case the project activity is exporting electricity to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	

Data unit:	Nm^3/hr
Description:	Quantity of hot air
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Where it is not feasible (e.g. because of too high temperature), spot measurements can be used through sampling with a 90% confidence level and a 10% precision
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recordings
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Nm^3/hr
Description:	Quantity of steam
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts)
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity during the year *y*
Source of data:	

Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. In case of equipment that produces hot water/oil this is expressed as the difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as the difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, aggregated annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Mass or volume unit
Description:	Quantity of fossil fuel type *j* combusted in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	$B_{Biomass,y}$
Data unit:	Mass or volume
Description:	Net quantity of biomass consumed in year *y*
Source of data:	
Measurement procedures (if any):	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass shall be measured continuously or in batches. If more than one type of biomass fuel is consumed, each shall be monitored separately.

	For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, NCV of the processed biomass that is supplied to users with an appropriate sampling frequency. Cross-check: Cross-check the measurements with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. In cases where emission reductions are calculated based on energy output, check the consistency of measurements *ex post* with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined *ex ante*
Monitoring frequency:	Continuously and estimate using annual mass/energy balance
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	%
Description:	Moisture content of the biomass (wet basis)
Source of data:	
Measurement procedures (if any):	On-site measurements. This applies in the case where emission reductions are calculated based on biomass energy input. For all cases, *ex ante* estimates should be provided in the PDD and used during the crediting period. In case of dry biomass, monitoring of this parameter is not necessary
Monitoring frequency:	The moisture content of biomass of homogeneous quality shall be monitored for each batch of biomass. The weighted average should be calculated for each monitoring period and used in the calculations
QA/QC procedures:	
Any comment:	

Data / Parameter:	*T*
Data unit:	°C
Description:	Temperature
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	*P*
Data unit:	kg/cm^2
Description:	Pressure

Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	NCV_k
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass type *k*
Source of data:	
Measurement procedures (if any):	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements)
Monitoring frequency:	Determine once in the first year of the crediting period
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-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.

SECTION A. General description of a generic CPA – Flaring + Thermal

A.1. Purpose and general description of generic CPAs

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This Component Project Activity (CPA) details the treatment of wastewater by way of anaerobic digestion at Site X. These wastewater sludges constitute typically primary (PS) and waste activated sludges (WAS). The biogas that is produced will be used on site and any excess will be flared.

Certified Emission Reductions (CERs) will be claimed for the small scale anaerobic digestion of sludge, using AMS-III.H and where applicable the displacement of fossil fuels with the combustion of biogas, using AMS-I.C.

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 will apply the following approved baseline and monitoring methodology:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16);

The CPA will apply the following approved combination of baseline and monitoring methodologies:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16); and
- Simplified baseline and monitoring methodology AMS-I.C 'Thermal Energy Production With or Without Electricity' (Version 19).

Along with all associated tools and guidance. The tools applicable to AMS-III.H are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Emissions From Solid Waste Disposal Sites' (Version 06.0.1);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Project Emissions From Flaring' (Version 02.0.0);

The tools relevant to AMS.I-C (when applicable) are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

Subsequent versions will be used where the above are superseded

B.2. Application of methodology(ies)

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The following table presents the application of the respective methodologies for a generic CPA whereby biogas is captured and used for the generation of thermal energy (AMS-III.H with the possibility of AMS-I.C). If applicability criteria referenced in the methodology are not included in the table below, it is considered that they will not be applicable to any potential CPA to be implemented under this PoA.

Applicability Criterion	Comment	Reference
Applicability of AMS-III.H		
AMS-III.H Version 16 comprises measures that recover biogas from biogenic biomass matter in wastewater by means of one, or a combination, of the following options: (g) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (h) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (i) Introduction of biogas recovery and combustion to a sludge treatment system;	The CPA will involve recovery of biogas from biogenic biomass matter by means of one, or a combination of, the options listed in the methodology.	AMS-III.H Version 16 Paragraph 1

(j) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an onsite industrial plant; (k) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (l) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).		
In cases where baseline system is anaerobic lagoon the methodology is applicable if: (d) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (e) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (f) The minimum interval between two consecutive sludge removal events shall be 30 days.	If applicable to the specific CPA, evidence will be provided in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 2
The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (f) Thermal or mechanical, electrical energy generation directly; (g) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas; or (h) Thermal or mechanical, electrical energy generation after upgrading and distribution: (iv) Upgrading and injection of biogas into a natural gas distribution grid with no	The CPA will utilise recovered biogas for renewable energy production directly (3a)	AMS-III.H Version 16 Paragraph 3

significant transmission constraints; (v) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (vi) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (i) Hydrogen production; (j) Use as fuel in transportation applications after upgrading.		
If the recovered biogas is used for project activities covered under paragraph 3 (a), that component of the project activity can use a corresponding methodology under Type I.	The CPA may also use corresponding methodology AMS-I.C if applicable.	AMS-III.H Version 16 Paragraph 4
New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	For CPAs which will be implemented under these circumstances, the respective guidance and methodology requirements will be adhered to.	AMS-III.H Version 16 Paragraph 12
The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	Each CPA will be identified by an address location and GPS coordinates for the treatment plant site and a description of the source(s) generating the wastewater.	AMS-III.H Version 16 Paragraph 13
Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	CPAs will only be included if they satisfy the requirement of generating less than 60kt CO_2 equivalent annually. This will be clearly documented in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 14
Applicability of AMS-I.C		
Biomass-based cogeneration systems are included in this category. For the purpose of this methodology "cogeneration" shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example heat from a boiler and	If applicable, the CPA will only apply one process for the simultaneous generation of thermal energy and electrical energy.	AMS-I.C Paragraph 2

electricity from a biogas engine) do not fit under the definition of cogeneration project.		
Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (d) Electricity supply to a grid; (e) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (f) Combination of (a) and (b).	One of the three scenarios will be applicable to each CPA and will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 3
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	Each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 4
For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 5
The following capacity limits apply for biomass cogeneration units: (d) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (e) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (f) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 6

accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.		
The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct from the existing units.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 7
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	If such conditions are applicable to the CPA, this will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 8
New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies".	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 9
Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 11
If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 12
If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand-alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 13

A sampling approach will not be applied, each CPA will be independently validated and verified

B.3. Sources and GHGs

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Source		GHGs	Included?	Justification/Explanation
Baseline	Direct emissions from the wastewater treatment process	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Emissions from electrical energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project Scenario	Biogas Recovery System	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Additional Electricity Use	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Generation of Electricity	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Combustion of biogas for thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

B.4. Description of baseline scenario

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The baseline for the generic CPA is the continued operation of the wastewater plant without anaerobic digestion and disposal of waste to anaerobic lagoon or similar SWDS

B.5. Demonstration of eligibility for a generic CPA

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Requirement		Evaluation Criteria	Method of Evaluation
1	The geographical boundary	The geographical boundary of the CPA falls within the geographical boundary of South Africa and is therefore consistent with the geographical boundary of the PoA	**CME signoff only**
2	Start date	The starting date of the CPA shall be earliest date at which the project implementation begins, which shall be determined based on either:	**Evidence**

		- the first signed major contract related to the CPA, or - The first combustion of biogas	
3	Avoidance of double counting of emission reductions	Confirm that the CPA is not registered for any other CDM activity	**CME signoff only**
4	Specification of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	This programme is specifically for the anaerobic digestion of wastewater streams to produce biogas in a controlled environment which will be flared or beneficially utilized.	**For Flaring: Equipment specification that the flare used is a closed flare** **For Thermal Use: Equipment specification for boiler/kiln**
5	Small Scale Threshold and Debundling	Check that the CERs do not exceed 60,000 p.a. and also that large scale projects have not been de-bundled into many smaller ones.	**CME signoff only**
6	Compliance with applicability and requirements of single or multiple methodologies	Confirmation that either: • Only AMS-III.H is used; or • AMS-III.H is used in combination with AMS-I.C; only	**CME signoff only**
7	Additionality	Additionality shall be in accordance with Methodological tool: "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", EB 70 Annex 05. (Version 02.1), Additionally will be demonstrated individually by the CPA according to the procedures described in the Section B.1 of this PoA-DD. The tool requires the following:	

		3. Confirmation that Anaerobic digestion followed by capture and destruction of biogas is not required by law or mandate	**CME signoff only**
		4. Confirmation of a positive IRR results from a financial analysis or basic costs calculation.	**CME signoff only**
8	Local stakeholder consultation	A local stakeholder consultation must be undertaken	**Evidence**
9	Environmental analysis	Environmental impact analysis including any transboundary impacts shall have been undertaken	**Evidence**
10	Funding from Annex 1 parties	No official Development Aid will be involved or diverted as a result of activities under the CPA. The official declarations of 'no development aid' have been provided by the project developers. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted	**Evidence**
11	Legal compliance	Compliance with South African waste legislation. This includes: Proof of ownership and/or permit to operate the WWTW	**Evidence**
12	Revenue from CERs	Agreement of revenue of CERs from	**Evidence**

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

B.6.1. Explanation of methodological choices

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This methodology addresses project activities where the organic matter present in wastewater streams, originally intended for disposal, is treated via anaerobic digestion. The CPA avoids methane emissions from wastewater in an anaerobic lagoon where methane emissions are naturally vented into the atmosphere. The GHGs involved in the baseline and project activity are CO_2 and CH_4.

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

Emissions reductions calculations are shown in section B.6.3
The associated tools with this methodology are qualified with respect to applicability as follows:

Applicability of methodological tool "Tool to calculate Project or Leakage CO2 emissions from fossil fuel combustion"

Over the site of the project activity, there may be fossil fuel combustion. Where there is, this tool will be employed to calculate the associated emissions, and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of Methodological tool "Emissions from solid waste disposal sites" (Version 06.0.1)

The tool is applicable to the POA under Application B: the CDM project activity avoids or involves the disposal of waste in an anaerobic lagoon or SWDS. This tool will be used where the CPA involves the treatment of wastewater with an alternative option, in this case, anaerobic digestion and thus it is not disposed of. The tool will be applied separately for each type of waste stream.

Applicability of methodological tool "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (Version 01)

Some equipment on site will use electricity. In such cases, this tool will be utilized to calculate the associated emissions from electricity consumption (especially considering that the RSA is largely dependent on coal as an electricity source), and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of methodological tool "Project emissions from flaring (Version 02.0.0)

Any GHG which is flared will need to be measured, and quantified. The destruction of that gas will further have an efficiency which will dictate the relevant emissions reductions.

Applicaibility of 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

If the biogas is beneficially utilized to produce heat or electricity, then this tool will be employed where relevant to calculate parameters from which emissions reductions will be determined

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

Baseline Emissions Calculations

Data / Parameter	ID xx - $BE_{s,treatment,y}$
Unit	tCO2e
Description	Baseline emissions of the sludge treatment systems affected by the project activity in year y
Source of data	Calculated
Value(s) applied	-
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - $S_{j,BL,y}$
Unit	t
Description	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario
Source of data	Sum Cape Flats sludge types, refer to the Calculation Spreadsheet Provided
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - j
Unit	-
Description	Number of types of sludge present and used in the calculations
Source of data	measured
Value(s) applied	5
Choice of data or Measurement methods and procedures	There are 5 types of sludge
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - DOC_s
Unit	-
Description	Degradable organic content of the untreated sludge generated in the year y
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	

Data / Parameter	ID xx - $MCF_{s,treatment,BL,J}$
Unit	-
Description	Methane correction factor for the baseline sludge treatment system j
Source of data	IPCC default values for MCF
Value(s) applied	0.8
Choice of data or Measurement methods and procedures	(MCF values as per Table III.H.1)
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - UF_{BL}
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	IPCC
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx -DOC_F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - F
Unit	-
Description	Fraction of CH4 in biogas
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - GWP_{CH4}
Unit	-
Description	Global Warming Potential of methane
Source of data	IPCC
Value(s) applied	21
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Project Activity Emissions Calculations

Data / Parameter	ID xx - $EC_{PJ,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Measured by electricity meter for equipment on site
Purpose of data	Project activity emissions from power
Additional comment	Calculated from information from COCT WW Dept.

Data / Parameter	ID xx - $EF_{EL,j,y}$
Unit	tCO2/MWh
Description	Emission factor for electricity generation for source j in year y
Source of data	Default value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Used default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $TD_{Lj,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	IPCC
Value(s) applied	0
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,ww,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y
Source of data	measured/assumed
Value(s) applied	0
Choice of data or Measurement methods and procedures	WWTW not applicable
Purpose of data	Fugitive emissions calculations
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,s,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Chosen to calculate instead of using the default value
Purpose of data	Fugitive emissions calculations
Additional comment	Conversely the IPCC default value of 0.05m3 biogas leaked per m3 biogas produced renders 5,220. This value can be given the default value but ID xx to ID xx are used in its calculation

Data / Parameter	ID xx - ***CFEs***
Unit	-
Description	Capture efficiency of the biogas recovery equipment in the sludge treatment system
Source of data	AMS-III.H
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	AMS-III-H default value
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	-

Data / Parameter	ID xx - $MEP_{s,treatment,y}$
Unit	t
Description	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from ID xx – ID xx

Data / Parameter	ID xx - $S_{l,PJ,y}$
Unit	t
Description	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y
Source of data	Sum of five different sludge types
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from data provided by the CoCT

AMS I.C Parameters
Baseline Emissions Calculation

Data / Parameter	IDxx - $EG_{thermal,y}$
Unit	TJ
Description	The net quantity of steam/heat supplied by the project activity during the year y
Source of data	Calculated/measured
Value(s) applied	XX
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Calculated by SLR based on xx l/hr of fuel

Data / Parameter	ID<u>xx</u> - $\eta_{BL,thermal}$
Unit	-
Description	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
Source of data	Assumed
Value(s) applied	Default value
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Assumption will be justified on the CPA

Data / Parameter	ID<u>xx</u> - $EF_{FF,CO2}$
Unit	tCO2/TJ
Description	The CO2 emission factor of the fossil fuel that would have been used in the baseline plan
Source of data	IPCC
Value(s) applied	<u>xx</u>
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline emissions calculation
Additional comment	Will depend on the fossil fuel used

Project Activity Emissions Calculation

Data / Parameter	ID<u>xx</u> - $PE_{s,y}$
Unit	tCO_2
Description	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y
Source of data	N/A
Value(s) applied	0
Choice of data or Measurement methods and procedures	Not applicable in this instance
Purpose of data	Project activity emissions calculation
Additional comment	-

Data / Parameter	ID<u>xx</u> - $\boldsymbol{PE_{FF,y}}$
Unit	tCO_2
Description	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y
Source of data	Calculated
Value(s) applied	Equal to $\boldsymbol{PE_{FC,j,y}}$
Choice of data or Measurement methods and procedures	-
Purpose of data	Project activity emissions calculation
Additional comment	Equal to $\boldsymbol{PE_{FC,j,y}}$

Data / Parameter	ID<u>xx</u> - $\boldsymbol{PE_{FC,j,y}}$
Unit	tCO_2
Description	CO2 emissions from fossil fuel combustion in process j during the year
Source of data	Calculated
Value(s) applied	<u>xx</u>
Choice of data or Measurement methods and procedures	Amount of fossil fuel used.
Purpose of data	Project activity emissions calculation
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

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The emissions reductions will be calculated according to the following formulae. The baseline emissions and project activity emissions are outlined for each methodology AMS-III.H and AMS-I.C individually. The formulae to calculate the leakage and the emissions reduction for all methodologies are the same and are therefore shown once at the end.

Formulae for AMS-III.H

Baseline Emissions for AMS-III

Baseline Emissions (AMS-III.H)

$$BE_y = BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}$$

Term	Description
BE_y	Baseline emissions in year y (tCO_2e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO_2e)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO_2e)
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO_2e)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)

$$BE_{s,treatment,y} = \sum S_{j,BL,y} * MCF_{s,treatment,BL,J} * DOC_s * UF_{BL} * DOC_f * F * 16/12 * GWP_{CH4}$$

Term	Description
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario (t)
j	Index for baseline sludge treatment system
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
$MCF_{s,treatment,BL,J}$	Methane correction factor for the baseline sludge treatment system j (MCF values as per Table III.H.1)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

$BE_{s,final,y} = \sum S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_f * F * 16/12 * GWP_{CH4}$	
Term	**Description**
$BE_{s,final,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$MCF_{s,BL,final}$	Methane correction factor for the baseline sludge treatment system (Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

Project Activity Emissions for AMS-III.H

Project Activity Emissions (AMS-III.H)	
$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y}$	
Term	**Description**
PE_y	Project activity emissions in the year y (tCO_2e)
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year y (tCO_2e).
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e)
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO_2e)
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y (tCO_2e)

$PE_{power,y} = PE_{EC,y} = \sum EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$	
Term	**Description**
$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$	
Term	**Description**
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO2e)
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y (tCO_2e)
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)

$PE_{fugitive,s,y} = (1 - CFE_s) * MEP_{s,treatment,y} * GWP_{CH4}$	
Term	**Description**
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)
CFE_s	Capture efficiency of the biogas recovery equipment in the sludge treatment systems (a default value of 0.9 shall be used)
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
GWP_{CH4}	IPCC standard value

$MEP_{s,treatment,y} = \sum (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$	
Term	**Description**
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
$S_{l,PJ,y}$	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y (t)
$MCF_{s,treatment,PJ,l}$	Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (MCF values as per Table III.H.1)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)

$PE_{flaring,y} = TM_{flared,y} * (1 - \eta_{flare,y}) * GWP_{CH4}$	
Term	**Description**
$PE_{flaring,y}$	Methane emissions due to incomplete flaring (tCO2e/yr)
$TM_{flared,y}$	Mass flow rate of methane flared in dry basis in the hour, h (tCH4/yr)
$\eta_{flare,y}$	Flare efficiency in hour, h based on default values
GWP_{CH4}	Global warming potential of methane

Additional formulae to be used if type I methodology AMS-I.C is included

Baseline Emissions for AMS-I.C

Baseline Emissions (AMS-I-C)	
$BE_{thermal,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$	
Term	**Description**
$BE_{thermal,CO2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year y (TJ)
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant (tCO_2/TJ)

Project Activity Emissions for AMS-I.C

Project Activity Emissions (AMS-I.C)	
$PE_{Geo,y} = PE_{s,y} + PE_{FF,y}$	
Term	**Description**
$PE_{Geo,y}$	Project emissions in year y (tCO_2/y)
$PE_{s,y}$	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO_2)
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2)
$PE_{FF,y} = PE_{FC,j,y}$	
Term	**Description**
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO2)
$PE_{FC,j,y}$	CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2)

For both methodologies

Leakage calculated for AMS-III.H and AMS-I.C

Leakage Emissions	
LE_y = *Estimated*	
Term	**Description**
LE_y	If the technology is using equipment transferred from another activity, leakage effects at the site of the other activity are to be considered and estimated (LE_y)

Emissions Reductions for AMS-III.H and AMS-I.C

Emission Reductions	
$ER_{y,ex\ ante} = BE_{y,ex\ ante} - (PE_{y,ex\ ante} + LE_{y,ex\ ante})$	
Term	**Description**
$ER_{y,ex\ ante}$	Ex ante emission reduction in year y (tCO_2e)
$BE_{y,ex\ ante}$	Ex ante baseline emissions in year y (tCO_2e)
$PE_{y,ex\ ante}$	Ex ante project emissions in year y (tCO_2e)
$LE_{y,ex\ ante}$	Ex ante leakage emissions in year y (tCO_2e)

A summary of emissions reductions is therefore presented as follows

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1: 2013	xx	xx	xx	xx
Year 2: 2014	xx	xx	xx	xx
Year 3: 2015	xx	xx	xx	xx
Year 4: 2016	xx	xx	xx	xx
Year 5: 2017	xx	xx	xx	xx
Year 6: 2018	xx	xx	xx	xx
Year 7: 2019	xx	xx	xx	xx
Total	xx	xx	xx	xx
Total number of crediting years	xx			
Annual average over the crediting period	xx	xx	xx	xx

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

As per AMS-III.H

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m³/month
Description:	The flow of wastewater
Source of data:	Measured
Measurement procedures (if any):	Measurements are undertaken using flow meters
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	-
Any comment:	

Data / Parameter:	$COD_{ww,untreated,y}$, $COD_{ww,treated,y}$, $COD_{ww,discharge,PJ,y}$
Data unit:	t COD/m³
Description:	The chemical oxygen demand of the wastewater before and after the treatment system affected by the project activity
Source of data:	Measured
Measurement procedures (if any):	Measure the COD according to national or international standards. COD is measured through representative sampling
Monitoring frequency:	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures:	

Any comment:	

Data / Parameter:	$S_{l,PJ,y}$, $S_{final,PJ,y,}$
Data unit:	t
Description:	Amount of dry matter in the sludge
Source of data:	Measured
Measurement procedures (if any):	Measure the total quantity of sludge on a wet basis. The volume (m^3) and density or direct weighing may be used to determine the sludge amount (wet basis). Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis. If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period. If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE
Monitoring frequency:	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level
QA/QC procedures:	
Any comment:	

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3
Description:	Biogas volume in year *y*
Source of data:	Measured
Measurement procedures (if any):	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network) shall be monitored *ex post*, using continuous flow meters. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions can be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before the separation. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	
Any comment:	

Data / Parameter:	$w_{CH4,y}$
Data unit:	%
Description:	Methane content in biogas in the year *y*
Source of data:	

Measurement procedures (if any):	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO_2 is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	
2. QA/QC procedures:	
Any comment:	-

Data / Parameter:	*T*
Data unit:	^{o}C
Description:	Temperature of the biogas
Source of data:	
Measurement procedures (if any):	The temperature of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	*P*
Data unit:	Pa
Description:	Pressure of the biogas
Source of data:	
Measurement procedures (if any):	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	η
Data unit:	%
Description:	Parameters related to emissions from electricity and/or fuel consumption in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares

Monitoring frequency:	
QA/QC procedures:	
Any comment:	

As per: "Emissions from Solid Waste Disposal Site"

Data / Parameter:	f_y
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
Source of data:	Select a maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Measurement procedures (if any):	-
Monitoring frequency:	For the application A: Once for the crediting period (f_y – f) For the application B: Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	W_x or W_i
Data unit:	t
Description:	Total amount of waste disposed in a SWDS in year *x* or month *i*
Source of data:	Measurements by project participants
Measurement procedures (if any):	Measure on a wet basis
Monitoring frequency:	Continuously, aggregated at least annually for year *x* or monthly for month *i*
QA/QC procedures:	
Any comment:	For application B

Data / Parameter:	$p_{n,j,x}$ or $p_{n,j,i}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample n collected during the year *x* or month *i*
Source of data:	Sample measurement by project participants
Measurement procedures (if any):	Sample the waste composition, using the waste categories *j*, as provided in the table for DOC_j and k_j, and weight each waste fraction (measure on wet basis)
Monitoring frequency:	Minimum of three samples every three months
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste type *j*. Sampling is not required if the waste comprises only one waste type.

Data / Parameter:	z_x
Data unit:	
Description:	Number of samples collected during year *x*
Source of data:	Project participants
Measurement procedures (if any):	Minimum of three samples every three months
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste category *j*.

Data / Parameter:	d_y
Data unit:	m
Description:	Depth of the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well, that is also used to measure the height of the water table ($h_{w,y}$).
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	$h_{w,y}$
Data unit:	m
Description:	Height of the water table in the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	a,b,c,d,e, g
Data unit:	%
Description:	Effect of the uncertainty of different parameters
Source of data:	Project participants
Measurement	Using the instructions in Table 3 in the methodological tool “Emissions from

procedures (if any):	solid waste disposal sites" (EB66 Annex 46).
Monitoring frequency:	Annually, if the conditions described in the "Instructions for selecting the factor" in table 3 in the methodological tool "Emissions from solid waste disposal sites" (EB66 Annex 46) have changed, (e.g. a change in how the weight of waste is measured). Once for the crediting period, if these conditions do not change.
QA/QC procedures:	-
Any comment:	Used in option 2 for determining the model correction factor.

From the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

Data / parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2/MWh
Description:	Combined margin emission factor for the grid in year *y*
Source of data:	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any):	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency:	As per the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	Only applicable to scenarios A and C (cases C.I and C.III)

Data / parameter:	$TDL_{j,y}$ and $TDL_{k,y}$ and $TDL_{l,y}$
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source *j*, *k* or *l* in year *y*
Source of data:	In case of scenario B and scenario C, case C.II, assume TDLj/k/l,y = 0 as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: • Use recent, accurate and reliable data available within the host country; • Use as default values of 20% for (c) project or leakage electricity consumption sources; (d) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. • Use as default values of 3% for (c) baseline electricity consumption sources; (d) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.

Measurement procedures (if any):	For a): $TDL_{j/k/l,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.
Monitoring frequency:	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures:	
Any comment:	

Data / parameter:	$FC_{n,i,t}$
Data unit:	Mass or (normalized) volume unit per year (in m^3, ton or l)
Description:	Quantity of fossil fuel type *i* fired in the captive power plant *n* in the time period *t*
Source of data:	Annual data during the crediting period: Onsite measurements Historical data: Historical records / onsite measurements
Measurement procedures (if any):	Use weight or volume meters
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	Only applicable if option B1 is used.

Data / Parameter:	$EG_{n,t}$
Data unit:	MWh
Description:	Quantity of electricity generated in captive power plant *n* in the time period *t*
Source of data:	Onsite measurements
Measurement procedures (if any):	Use electricity meters
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	Cross check measurement results with records for sold electricity where relevant
Any comment:	Only applicable if option B1 is used

Data / parameter:	$HG_{n,t}$
Data unit:	GJ
Description:	Quantity of heat co-generated in captive power plant *n* in the period *t*
Source of data:	Onsite measurements
Monitoring frequency:	Use meters
Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot water generated minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.

QA/QC procedures:	Cross check measurement results with records for sold heat and the other energy measurements where relevant.
Any comment:	Only applicable if option B1 is used and if heat generation is not ignored (subject to the conditions outlined above)

Data / parameter:	$\eta_{boiler,y}$
Data unit:	-
Description:	Efficiency of the boiler in which heat is assumed to be generated in the absence
Source of data:	Choose among the following options:
Monitoring frequency:	c) Once at the start of the project activity d) Not applicable
Measurement procedures (if any):	c) Use national or international standards to determine the boiler efficiency d) Not applicable
QA/QC procedures:	-
Any comment:	Only applicable to option B1 and in cases where CO2 emissions from cogeneration are allocated to heat and power

Data / parameter:	NCVi,t	
Data unit:	GJ / mass or volume unit	
Description:	Average net calorific value of fossil fuel type *i* used in the period *t*	
Source of data:	The following data sources may be used if the relevant conditions apply:	
	Data source	**Conditions for using the data source**
	e) Values provided by the fuel supplier in invoices	This is the preferred source
	f) Measurements by the project participants	If a) is not available
	g) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy
	h) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall out this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Only applicable if option B1 is used

Data / parameter:	EFCO2,i,t
Data unit:	t CO2 / GJ
Description:	CO2 emission factor of fossil fuel type *i* used in the period *t*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
e) Values provided by the fuel supplier in invoices	This is the preferred source.
f) Measurements by the project participants	If a) is not available
g) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
h) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account

Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, options b), c) or d) should be used.
QA/QC procedures:	
Any comment:	Only applicable if option B1 is used

From the "Tool to calculate project of leakage CO2 emissions from fossil fuel combustion"

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *J* during the year *y*
Source of data:	Onsite measurements
Measurement procedures (if any):	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

Data / Parameter:	$w_{C,i,y}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for Using Data**
c) Values provided by the fuel supplier and invoices	This is the preferred source
d) Measurements	If a) is not available

	by the project participants |
Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used

Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions applu:

Data Source	**Conditions for using the data**
a) Values provided by the fuel supplier	This is the preferred source
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available. These sources can only be used for liquid fuels and should be based on well documents, reliable sources.

Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	
Any comment:	Applicable where Option A is used and where $_{FCi.j.y}$ is measured in a volume unit. Preferably the same data source should be used for $_{wC,i,y}$ and $\rho i,y$.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m^3, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for using the data**

	e) Values provided by the fuel supplier in invoices	This is the preferred source if the carbon fraction of the fuel is not provided (Option A)
	f) Measurements by the project participants	If a) is not available
	g) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
	h) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards	
Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account	
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.	
Any comment:	Applicable where Option B is used	

Data / Parameter:	$EF_{CO2,j,y}$	
Data unit:	tCO_2/GJ	
Description:	Weighted average CO_2 emission factor of fuel type *j* in year *y*	
Source of data:	The following data source may be used if the relevant conditions apply:	
	Data Source	**Conditions for using the data source**
	e) Values provided by the fuel supplier in invoices	This is the preferred source
	f) Measurements by the project participants	If a) is not available
	g) Regional or national default	If a) is not available.

	values	This source can only be used for liquid fuels and should be based on well documented reliable sources (such as national energy balances)
	h) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of the Chapter 1 of Vol. 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available.
Measurement procedures (if any):	For a) and b), measurements should be undertaken in line with the national or international fuel standards.	
Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually	
QA/QC procedures:		
Any comment:	Applicable where option B is used. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, Options b), c) or d) should be used.	

Where applicable, AMS.I-C parameters to be monitored.

Data / Parameter:	
Data unit:	
Description:	Continuous operation of the equipment/ system
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance
QA/QC procedures:	
Any comment:	If the emissions reduction per system is less than five tonnes of CO_2e a year; or In the case of household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible: (i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute), if necessary using survey methods;

	(ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available. Where necessary refer to the "General guidelines for sampling and surveys for SSC project activities"

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2e/kWh
Description:	CO_2 emission factor for the grid electricity in year *y*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2e/GJ
Description:	CO_2 emission factor of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"

Data / Parameter:	
Data unit:	MWh
Description:	Quantity of electricity generated/ supplied
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". In case the project activity is exporting electricity to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	

Data unit:	Nm^3/hr
Description:	Quantity of hot air
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Where it is not feasible (e.g. because of too high temperature), spot measurements can be used through sampling with a 90% confidence level and a 10% precision
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recordings
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Nm^3/hr
Description:	Quantity of steam
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts)
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity during the year *y*
Source of data:	

Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. In case of equipment that produces hot water/oil this is expressed as the difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as the difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, aggregated annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Mass or volume unit
Description:	Quantity of fossil fuel type *j* combusted in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	$B_{Biomass,y}$
Data unit:	Mass or volume
Description:	Net quantity of biomass consumed in year *y*
Source of data:	
Measurement procedures (if any):	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass shall be measured continuously or in batches. If more than one type of biomass fuel is consumed, each shall be monitored separately.

	For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, NCV of the processed biomass that is supplied to users with an appropriate sampling frequency. Cross-check: Cross-check the measurements with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. In cases where emission reductions are calculated based on energy output, check the consistency of measurements *ex post* with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined *ex ante*
Monitoring frequency:	Continuously and estimate using annual mass/energy balance
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	%
Description:	Moisture content of the biomass (wet basis)
Source of data:	
Measurement procedures (if any):	On-site measurements. This applies in the case where emission reductions are calculated based on biomass energy input. For all cases, *ex ante* estimates should be provided in the PDD and used during the crediting period. In case of dry biomass, monitoring of this parameter is not necessary
Monitoring frequency:	The moisture content of biomass of homogeneous quality shall be monitored for each batch of biomass. The weighted average should be calculated for each monitoring period and used in the calculations
QA/QC procedures:	
Any comment:	

Data / Parameter:	*T*
Data unit:	°C
Description:	Temperature
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	*P*
Data unit:	kg/cm^2
Description:	Pressure

Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	NCV_k
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass type *k*
Source of data:	
Measurement procedures (if any):	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements)
Monitoring frequency:	Determine once in the first year of the crediting period
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-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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SECTION A. General description of a generic CPA – Flaring + CHP

A.1. Purpose and general description of generic CPAs

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This Component Project Activity (CPA) details the treatment of wastewater by way of anaerobic digestion at Site X. These wastewater sludges constitute typically primary (PS) and waste activated sludges (WAS). The biogas that is produced will be used on site and any excess will be flared.

Certified Emission Reductions (CERs) will be claimed for the small scale anaerobic digestion of sludge, using AMS-III.H and where applicable the displacement of fossil fuels with the combustion of biogas, using AMS-I.C.

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 will apply the following approved baseline and monitoring methodology:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16);

The CPA will apply the following approved combination of baseline and monitoring methodologies:

- Simplified baseline and monitoring methodology AMS-III.H 'Methane Recovery in Wastewater Treatment (Version 16); and
- Simplified baseline and monitoring methodology AMS-I.C 'Thermal Energy Production With or Without Electricity' (Version 19).

Along with all associated tools and guidance. The tools applicable to AMS-III.H are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Emissions From Solid Waste Disposal Sites' (Version 06.0.1);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Project Emissions From Flaring' (Version 02.0.0);

The tools relevant to AMS.I-C (when applicable) are:

- 'Tool to Calculate Project or Leakage CO2 Emissions From Fossil Fuel Combustion' (Version 02);
- 'Tool to Calculate Baseline, Project and/or Leakage Emissions From Electricity Consumption' (Version 01);
- 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

Subsequent versions will be used where the above are superseded

B.2. Application of methodology(ies)

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The following table presents the application of the respective methodologies for a generic CPA whereby biogas is captured and used for the generation of thermal energy (AMS-III.H with the possibility of AMS-I.C). If applicability criteria referenced in the methodology are not included in the table below, it is considered that they will not be applicable to any potential CPA to be implemented under this PoA.

Applicability Criterion	Comment	Reference
Applicability of AMS-III.H		
AMS-III.H Version 16 comprises measures that recover biogas from biogenic biomass matter in wastewater by means of one, or a combination, of the following options: (m) Substitution of aerobic wastewater or sludge treatment systems with anaerobic systems with biogas recovery and combustion; (n) Introduction of anaerobic sludge treatment system with biogas recovery and combustion to a wastewater treatment plant without sludge treatment; (o) Introduction of biogas recovery and combustion to a sludge treatment system;	The CPA will involve recovery of biogas from biogenic biomass matter by means of one, or a combination of, the options listed in the methodology.	AMS-III.H Version 16 Paragraph 1

(p) Introduction of biogas recovery and combustion to an anaerobic wastewater treatment system such as anaerobic reactor, lagoon, septic tank or an onsite industrial plant; (q) Introduction of anaerobic wastewater treatment with biogas recovery and combustion, with or without anaerobic sludge treatment, to an untreated wastewater stream; (r) Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion, with or without sludge treatment, to an anaerobic wastewater treatment system without biogas recovery (e.g. introduction of treatment in an anaerobic reactor with biogas recovery as a sequential step for the wastewater that is presently being treated in an anaerobic lagoon without methane recovery).		
In cases where baseline system is anaerobic lagoon the methodology is applicable if: (g) The lagoons are ponds with a depth greater than two meters, without aeration. The value for depth is obtained from engineering design documents, or through direct measurement, or by dividing the surface area by the total volume. If the lagoon filling level varies seasonally, the average of the highest and lowest levels may be taken; (h) Ambient temperature above 15°C, at least during part of the year, on a monthly average basis; (i) The minimum interval between two consecutive sludge removal events shall be 30 days.	If applicable to the specific CPA, evidence will be provided in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 2
The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (k) Thermal or mechanical, electrical energy generation directly; (l) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas; or (m) Thermal or mechanical, electrical energy generation after upgrading and distribution: (vii) Upgrading and injection of biogas into a natural gas distribution grid with no	The CPA will utilise recovered biogas for renewable energy production directly (3a)	AMS-III.H Version 16 Paragraph 3

significant transmission constraints; (viii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (ix) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (n) Hydrogen production; (o) Use as fuel in transportation applications after upgrading.		
If the recovered biogas is used for project activities covered under paragraph 3 (a), that component of the project activity can use a corresponding methodology under Type I.	The CPA may also use corresponding methodology AMS-I.C if applicable.	AMS-III.H Version 16 Paragraph 4
New facilities (Greenfield projects) and project activities involving a change of equipment resulting in a capacity addition of the wastewater or sludge treatment system compared to the designed capacity of the baseline treatment system are only eligible to apply this methodology if they comply with the relevant requirements in the "General guidelines to SSC CDM methodologies". In addition the requirements for demonstrating the remaining lifetime of the equipment replaced, as described in the general guidelines shall be followed.	For CPAs which will be implemented under these circumstances, the respective guidance and methodology requirements will be adhered to.	AMS-III.H Version 16 Paragraph 12
The location of the wastewater treatment plant as well as the source generating the wastewater shall be uniquely defined and described in the PDD.	Each CPA will be identified by an address location and GPS coordinates for the treatment plant site and a description of the source(s) generating the wastewater.	AMS-III.H Version 16 Paragraph 13
Measures are limited to those that result in aggregate emissions reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	CPAs will only be included if they satisfy the requirement of generating less than 60kt CO_2 equivalent annually. This will be clearly documented in the respective CPA-DD.	AMS-III.H Version 16 Paragraph 14
Applicability of AMS-I.C		
Biomass-based cogeneration systems are included in this category. For the purpose of this methodology "cogeneration" shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example heat from a boiler and	If applicable, the CPA will only apply one process for the simultaneous generation of thermal energy and electrical energy.	AMS-I.C Paragraph 2

electricity from a biogas engine) do not fit under the definition of cogeneration project.		
Emission reductions from a biomass cogeneration system can accrue from one of the following activities: (g) Electricity supply to a grid; (h) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities; (i) Combination of (a) and (b).	One of the three scenarios will be applicable to each CPA and will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 3
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	Each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 4
For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 5
The following capacity limits apply for biomass cogeneration units: (g) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (h) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal; (i) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 6

accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.		
The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct from the existing units.	Where applicable, each CPA will comply with this requirement and compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 7
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	If such conditions are applicable to the CPA, this will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 8
New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC CDM methodologies".	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 9
Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 11
If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA	AMS-I.C Paragraph 12
If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand-alone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.	If such conditions are applicable to the CPA, compliance will be clearly documented in the respective CPA-DD.	AMS-I.C Paragraph 13

A sampling approach will not be applied, each CPA will be independently validated and verified

B.3. Sources and GHGs

>>

Source		GHGs	Included?	Justification/Explanation
Baseline	Direct emissions from the wastewater treatment process	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Emissions from electrical energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Emissions from thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
Project Scenario	Biogas Recovery System	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Additional Electricity Use	CO_2	Yes	Main emission source
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Generation of Electricity	CO_2	No	Excluded for simplification
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification
	Combustion of biogas for thermal energy generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification

B.4. Description of baseline scenario

>>

The baseline for the generic CPA is the continued operation of the wastewater plant without anaerobic digestion and disposal of waste to anaerobic lagoon or similar SWDS

B.5. Demonstration of eligibility for a generic CPA

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Requirement		Evaluation Criteria	Method of Evaluation
1	The geographical boundary	The geographical boundary of the CPA falls within the geographical boundary of South Africa and is therefore consistent with the geographical boundary of the PoA	**CME signoff only**
2	Start date	The starting date of the CPA shall be earliest date at which the project implementation begins, which shall be determined based on either:	**Evidence**

		- the first signed major contract related to the CPA, or - The first combustion of biogas	
3	Avoidance of double counting of emission reductions	Confirm that the CPA is not registered for any other CDM activity	**CME signoff only**
4	Specification of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications	This programme is specifically for the anaerobic digestion of wastewater streams to produce biogas in a controlled environment which will be flared or beneficially utilized.	**For Flaring: Equipment specification that the flare used is a closed flare** **For Thermal Use: Equipment specification for boiler/kiln** **For CHP: That needed for thermal, as well as equipment specification for gas engine and (where necessary) switchgear**
5	Small Scale Threshold and Debundling	Check that the CERs do not exceed 60,000 p.a. and also that large scale projects have not been de-bundled into many smaller ones.	**CME signoff only**
6	Compliance with applicability and requirements of single or multiple methodologies	Confirmation that either: • Only AMS-III.H is used; or • AMS-III.H is used in combination with AMS-I.C; only	**CME signoff only**
7	Additionality	Additionality shall be in accordance with Methodological tool: "Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities", EB 70 Annex 05. (Version 02.1), Additionally will be demonstrated individually by the CPA according to the procedures described in the Section B.1 of this PoA-DD.	

		The tool requires the following: 4. Confirmation that Anaerobic digestion followed by capture and destruction of biogas is not required by law or mandate 5. Confirmation of a positive IRR results from a financial analysis or basic costs calculation.	**CME signoff only** **CME signoff only**
8	Local stakeholder consultation	A local stakeholder consultation must be undertaken	**Evidence**
9	Environmental analysis	Environmental impact analysis including any transboundary impacts shall have been undertaken	**Evidence**
10	Funding from Annex 1 parties	No official Development Aid will be involved or diverted as a result of activities under the CPA. The official declarations of 'no development aid' have been provided by the project developers. If Annex 1 countries are involved, then a declaration from the concerned agency in Annex 1 country should also be submitted	**Evidence**
11	Legal compliance	Compliance with South African waste legislation. This includes: Proof of ownership and/or permit to operate the WWTW	**Evidence**
12	Revenue from CERs	Agreement of revenue of CERs from	**Evidence**

B.6. Estimation of emission reductions of a generic CPA
B.6.1. Explanation of methodological choices
>>
This methodology addresses project activities where the organic matter present in wastewater streams, originally intended for disposal, is treated via anaerobic digestion. The CPA avoids methane emissions from wastewater in an anaerobic lagoon where methane emissions are naturally vented into the atmosphere. The GHGs involved in the baseline and project activity are CO_2 and CH_4.

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

Emissions reductions calculations are shown in section B.6.3
The associated tools with this methodology are qualified with respect to applicability as follows:

Applicability of methodological tool "Tool to calculate Project or Leakage CO2 emissions from fossil fuel combustion"

Over the site of the project activity, there may be fossil fuel combustion. Where there is, this tool will be employed to calculate the associated emissions, and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of Methodological tool "Emissions from solid waste disposal sites" (Version 06.0.1)

The tool is applicable to the POA under Application B: the CDM project activity avoids or involves the disposal of waste in an anaerobic lagoon or SWDS. This tool will be used where the CPA involves the treatment of wastewater with an alternative option, in this case, anaerobic digestion and thus it is not disposed of. The tool will be applied separately for each type of waste stream.

Applicability of methodological tool "Tool to calculate baseline, project and/or leakage emission from electricity consumption" (Version 01)

Some equipment on site will use electricity. In such cases, this tool will be utilized to calculate the associated emissions from electricity consumption (especially considering that the RSA is largely dependent on coal as an electricity source), and further, where relevant, to calculate the emissions reductions (if any) which would arise from the beneficial utilization of biogas produced.

Applicability of methodological tool "Project emissions from flaring (Version 02.0.0)

Any GHG which is flared will need to be measured, and quantified. The destruction of that gas will further have an efficiency which will dictate the relevant emissions reductions.

Applicaibility of 'Tool to determine the baseline efficiency of thermal or electric Energy Generation Systems' (Version 01);

If the biogas is beneficially utilized to produce heat or electricity, then this tool will be employed where relevant to calculate parameters from which emissions reductions will be determined

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

Baseline Emissions Calculations

Data / Parameter	ID xx - $BE_{s,treatment,y}$
Unit	tCO2e
Description	Baseline emissions of the sludge treatment systems affected by the project activity in year y
Source of data	Calculated
Value(s) applied	-
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - $S_{j,BL,y}$
Unit	t
Description	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario
Source of data	Sum Cape Flats sludge types, refer to the Calculation Spreadsheet Provided
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - j
Unit	-
Description	Number of types of sludge present and used in the calculations
Source of data	measured
Value(s) applied	5
Choice of data or Measurement methods and procedures	There are 5 types of sludge
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - DOC_s
Unit	-
Description	Degradable organic content of the untreated sludge generated in the year y
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	

Data / Parameter	ID xx - $MCF_{s,treatment,BL,J}$
Unit	-
Description	Methane correction factor for the baseline sludge treatment system j
Source of data	IPCC default values for MCF
Value(s) applied	0.8
Choice of data or Measurement methods and procedures	(MCF values as per Table III.H.1)
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - UF_{BL}
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	IPCC
Value(s) applied	0.89
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx -DOC_F
Unit	-
Description	Fraction of DOC dissimilated to biogas
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - F
Unit	-
Description	Fraction of CH4 in biogas
Source of data	IPCC
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Data / Parameter	ID xx - GWP_{CH4}
Unit	-
Description	Global Warming Potential of methane
Source of data	IPCC
Value(s) applied	21
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline for sludge treatment calculation
Additional comment	-

Project Activity Emissions Calculations

Data / Parameter	ID xx - $EC_{PJ,j,y}$
Unit	MWh/yr
Description	Quantity of electricity consumed by the project electricity consumption source j in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Measured by electricity meter for equipment on site
Purpose of data	Project activity emissions from power
Additional comment	Calculated from information from COCT WW Dept.

Data / Parameter	ID xx - $EF_{EL,j,y}$
Unit	tCO2/MWh
Description	Emission factor for electricity generation for source j in year y
Source of data	Default value
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Used default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $TD_{Lj,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to source j in year y
Source of data	IPCC
Value(s) applied	0
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Project activity emissions from power
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,ww,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y
Source of data	measured/assumed
Value(s) applied	0
Choice of data or Measurement methods and procedures	WWTW not applicable
Purpose of data	Fugitive emissions calculations
Additional comment	-

Data / Parameter	ID xx - $PE_{fugitive,s,y}$
Unit	tCO_2e
Description	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	Chosen to calculate instead of using the default value
Purpose of data	Fugitive emissions calculations
Additional comment	Conversely the IPCC default value of 0.05m3 biogas leaked per m3 biogas produced renders 5,220. This value can be given the default value but ID xx to ID xx are used in its calculation

Data / Parameter	ID xx - ***CFEs***
Unit	-
Description	Capture efficiency of the biogas recovery equipment in the sludge treatment system
Source of data	AMS-III.H
Value(s) applied	0.9
Choice of data or Measurement methods and procedures	AMS-III-H default value
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	-

Data / Parameter	ID xx - $MEP_{s,treatment,y}$
Unit	t
Description	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y
Source of data	Calculated
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from ID xx – ID xx

Data / Parameter	ID xx - $S_{l,PJ,y}$
Unit	t
Description	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y
Source of data	Sum of five different sludge types
Value(s) applied	xx
Choice of data or Measurement methods and procedures	-
Purpose of data	Fugitive emissions from sludge calculations
Additional comment	Calculated from data provided by the CoCT

AMS I.C Parameters
Baseline Emissions Calculation

Data / Parameter	IDxx - $EG_{thermal,y}$
Unit	TJ
Description	The net quantity of steam/heat supplied by the project activity during the year y
Source of data	Calculated/measured
Value(s) applied	XX
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Calculated by SLR based on xx l/hr of fuel

Data / Parameter	ID xx - $\eta_{BL,thermal}$
Unit	-
Description	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
Source of data	Assumed
Value(s) applied	Default value
Choice of data or Measurement methods and procedures	-
Purpose of data	Baseline emissions calculation
Additional comment	Assumption will be justified on the CPA

Data / Parameter	ID xx - $EF_{FF,CO2}$
Unit	tCO2/TJ
Description	The CO2 emission factor of the fossil fuel that would have been used in the baseline plan
Source of data	IPCC
Value(s) applied	xx
Choice of data or Measurement methods and procedures	IPCC default value
Purpose of data	Baseline emissions calculation
Additional comment	Will depend on the fossil fuel used

Project Activity Emissions Calculation

Data / Parameter	ID xx - $PE_{s,y}$
Unit	tCO_2
Description	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y
Source of data	N/A
Value(s) applied	0
Choice of data or Measurement methods and procedures	Not applicable in this instance
Purpose of data	Project activity emissions calculation
Additional comment	-

Data / Parameter	ID<u>xx</u> - $PE_{FF,y}$
Unit	tCO_2
Description	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y
Source of data	Calculated
Value(s) applied	Equal to $PE_{FC,j,y}$
Choice of data or Measurement methods and procedures	-
Purpose of data	Project activity emissions calculation
Additional comment	Equal to $PE_{FC,j,y}$

Data / Parameter	ID<u>xx</u> - $PE_{FC,j,y}$
Unit	tCO_2
Description	CO2 emissions from fossil fuel combustion in process j during the year
Source of data	Calculated
Value(s) applied	<u>xx</u>
Choice of data or Measurement methods and procedures	Amount of fossil fuel used.
Purpose of data	Project activity emissions calculation
Additional comment	-

B.6.3. Ex-ante calculations of emission reductions

>>

The emissions reductions will be calculated according to the following formulae. The baseline emissions and project activity emissions are outlined for each methodology AMS-III.H and AMS-I.C individually. The formulae to calculate the leakage and the emissions reduction for all methodologies are the same and are therefore shown once at the end.

Formulae for AMS-III.H

Baseline Emissions for AMS-III

Baseline Emissions (AMS-III.H)

$$BE_y = BE_{power,y} + BE_{ww,treatment,y} + BE_{s,treatment,y} + BE_{ww,discharge,y} + BE_{s,final,y}$$

Term	Description
BE_y	Baseline emissions in year y (tCO_2e)
$BE_{power,y}$	Baseline emissions from electricity or fuel consumption in year y (tCO_2e)
$BE_{ww,treatment,y}$	Baseline emissions of the wastewater treatment systems affected by the project activity in year y (tCO_2e)
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$BE_{ww,discharge,y}$	Baseline methane emissions from degradable organic carbon in treated wastewater discharged into sea/river/lake in year y (tCO_2e)
$BE_{s,final,y}$	Baseline methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)

$$BE_{s,treatment,y} = \sum S_{j,BL,y} * MCF_{s,treatment,BL,J} * DOC_s * UF_{BL} * DOC_f * F * 16/12 * GWP_{CH4}$$

Term	Description
$BE_{s,treatment,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{j,BL,y}$	Amount of dry matter in the sludge that would have been treated by the sludge treatment system j in the baseline scenario (t)
j	Index for baseline sludge treatment system
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
$MCF_{s,treatment,BL,J}$	Methane correction factor for the baseline sludge treatment system j (MCF values as per Table III.H.1)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

$BE_{s,final,y} = \sum S_{final,BL,y} * DOC_s * UF_{BL} * MCF_{s,BL,final} * DOC_f * F * 16/12 * GWP_{CH4}$	
Term	**Description**
$BE_{s,final,y}$	Baseline emissions of the sludge treatment systems affected by the project activity in year y (tCO_2e)
$S_{final,BL,y}$	Amount of dry matter in the final sludge generated by the baseline wastewater treatment systems in the year y (t)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{BL}	Model correction factor to account for model uncertainties (0.89)
$MCF_{s,BL,final}$	Methane correction factor for the baseline sludge treatment system (Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)
GWP_{CH4}	IPCC standard value

Project Activity Emissions for AMS-III.H

Project Activity Emissions (AMS-III.H)	
$PE_y = PE_{power,y} + PE_{ww,treatment,y} + PE_{s,treatment,y} + PE_{ww,discharge,y} + PE_{s,final,y} + PE_{fugitive,y} + PE_{biomass,y} + PE_{flaring,y}$	
Term	**Description**
PE_y	Project activity emissions in the year y (tCO_2e)
$PE_{power,y}$	Emissions from electricity or fuel consumption in the year y (tCO_2e).
$PE_{ww,treatment,y}$	Methane emissions from wastewater treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{s,treatment,y}$	Methane emissions from sludge treatment systems affected by the project activity, and not equipped with biogas recovery (tCO_2e)
$PE_{ww,discharge,y}$	Methane emissions from degradable organic carbon in treated wastewater in year y (tCO_2e)
$PE_{s,final,y}$	Methane emissions from anaerobic decay of the final sludge produced in year y (tCO_2e)
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO_2e)
$PE_{biomass,y}$	Methane emissions from biomass stored under anaerobic conditions
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y (tCO_2e)

$PE_{power,y} = PE_{EC,y} = \sum EC_{PJ,j,y} * EF_{EL,j,y} * (1 + TDL_{j,y})$	
Term	**Description**
$PE_{EC,y}$	Project emissions from electricity consumption in year y (tCO2/yr)
$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr)
$EF_{EL,j,y}$	Emission factor for electricity generation for source j in year y (tCO2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

$PE_{fugitive,y} = PE_{fugitive,ww,y} + PE_{fugitive,s,y}$	
Term	**Description**
$PE_{fugitive,y}$	Methane emissions from biogas release in capture systems in year y, calculated as per paragraph 30 (tCO2e)
$PE_{fugitive,ww,y}$	Fugitive emissions through capture inefficiencies in the anaerobic wastewater treatment systems in the year y (tCO_2e)
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)

$PE_{fugitive,s,y} = (1 - CFE_s) * MEP_{s,treatment,y} * GWP_{CH4}$	
Term	**Description**
$PE_{fugitive,s,y}$	Fugitive emissions through capture inefficiencies in the anaerobic sludge treatment systems in the year y (tCO_2e)
CFE_s	Capture efficiency of the biogas recovery equipment in the sludge treatment systems (a default value of 0.9 shall be used)
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
GWP_{CH4}	IPCC standard value

$MEP_{s,treatment,y} = \sum (S_{l,PJ,y} * MCF_{s,treatment,PJ,l}) * DOC_s * UF_{PJ} * DOC_F * F * 16/12$	
Term	**Description**
$MEP_{s,treatment,y}$	Methane emission potential of the sludge treatment systems equipped with a biogas recovery system in year y (t)
$S_{l,PJ,y}$	Amount of sludge treated in the project sludge treatment system l equipped with a biogas recovery system (on a dry basis) in year y (t)
$MCF_{s,treatment,PJ,l}$	Methane correction factor for the sludge treatment system equipped with biogas recovery equipment (MCF values as per Table III.H.1)
DOC_s	Degradable organic content of the untreated sludge generated in the year y (fraction, dry basis)
UF_{PJ}	Model correction factor to account for model uncertainties (1.12)
DOC_F	Fraction of DOC dissimilated to biogas (IPCC default value of 0.5)
F	Fraction of CH_4 in biogas (IPCC default of 0.5)

$PE_{flaring,y} = TM_{flared,y} * (1 - \eta_{flare,y}) * GWP_{CH4}$	
Term	**Description**
$PE_{flaring,y}$	Methane emissions due to incomplete flaring (tCO2e/yr)
$TM_{flared,y}$	Mass flow rate of methane flared in dry basis in the hour, h (tCH4/yr)
$\eta_{flare,y}$	Flare efficiency in hour, h based on default values
GWP_{CH4}	Global warming potential of methane

Additional formulae to be used if type I methodology AMS-I.C is included

Baseline Emissions for AMS-I.C

Baseline Emissions (AMS-I-C)	
$BE_{thermal,CO2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO2}$	
Term	**Description**
$BE_{thermal,CO2,y}$	The baseline emissions from steam/heat displaced by the project activity during the year y (tCO_2)
$EG_{thermal,y}$	The net quantity of steam/heat supplied by the project activity during the year y (TJ)
$\eta_{BL,thermal}$	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity
$EF_{FF,CO2}$	The CO_2 emission factor of the fossil fuel that would have been used in the baseline plant (tCO_2/TJ)

Project Activity Emissions for AMS-I.C

Project Activity Emissions (AMS-I.C)	
$PE_{Geo,y} = PE_{s,y} + PE_{FF,y}$	
Term	**Description**
$PE_{Geo,y}$	Project emissions in year y (tCO_2/y)
$PE_{s,y}$	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO_2)
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2)
$PE_{FF,y} = PE_{FC,j,y}$	
Term	**Description**
$PE_{FF,y}$	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO2)
$PE_{FC,j,y}$	CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2)

For both methodologies

Leakage calculated for AMS-III.H and AMS-I.C

Leakage Emissions	
LE_y = *Estimated*	
Term	**Description**
LE_y	If the technology is using equipment transferred from another activity, leakage effects at the site of the other activity are to be considered and estimated (LE_y)

Emissions Reductions for AMS-III.H and AMS-I.C

Emission Reductions	
$ER_{y,ex\ ante} = BE_{y,ex\ ante} - (PE_{y,ex\ ante} + LE_{y,ex\ ante})$	
Term	**Description**
$ER_{y,ex\ ante}$	Ex ante emission reduction in year y (tCO_2e)
$BE_{y,ex\ ante}$	Ex ante baseline emissions in year y (tCO_2e)
$PE_{y,ex\ ante}$	Ex ante project emissions in year y (tCO_2e)
$LE_{y,ex\ ante}$	Ex ante leakage emissions in year y (tCO_2e)

A summary of emissions reductions is therefore presented as follows

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1: 2013	xx	xx	xx	xx
Year 2: 2014	xx	xx	xx	xx
Year 3: 2015	xx	xx	xx	xx
Year 4: 2016	xx	xx	xx	xx
Year 5: 2017	xx	xx	xx	xx
Year 6: 2018	xx	xx	xx	xx
Year 7: 2019	xx	xx	xx	xx
Total	xx	xx	xx	xx
Total number of crediting years	xx			
Annual average over the crediting period	xx	xx	xx	xx

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

As per AMS-III.H

Data / Parameter:	$Q_{ww,i,y}$
Data unit:	m³/month
Description:	The flow of wastewater
Source of data:	Measured
Measurement procedures (if any):	Measurements are undertaken using flow meters
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	-
Any comment:	

Data / Parameter:	$COD_{ww,untreated,y}$, $COD_{ww,treated,y}$, $COD_{ww,discharge,PJ,y}$
Data unit:	t COD/m³
Description:	The chemical oxygen demand of the wastewater before and after the treatment system affected by the project activity
Source of data:	Measured
Measurement procedures (if any):	Measure the COD according to national or international standards. COD is measured through representative sampling
Monitoring frequency:	Samples and measurements shall ensure a 90/10 confidence/precision level
QA/QC procedures:	

Any comment:	

Data / Parameter:	$S_{l,PJ,y}$, $S_{final,PJ,y,}$
Data unit:	t
Description:	Amount of dry matter in the sludge
Source of data:	Measured
Measurement procedures (if any):	Measure the total quantity of sludge on a wet basis. The volume (m^3) and density or direct weighing may be used to determine the sludge amount (wet basis). Representative samples are taken to determine the moisture content to calculate the total sludge amount on dry basis. If the methane emissions from anaerobic decay of the final sludge are to be neglected because the sludge is controlled combusted, disposed of in a landfill with methane recovery, or used for soil application, then the end-use of the final sludge will be monitored during the crediting period. If the baseline emissions include the anaerobic decay of final sludge generated by the baseline treatment systems in a landfill without methane recovery, the baseline disposal site shall be clearly defined, and verified by the DOE
Monitoring frequency:	Monitoring of 100% of the sludge amount through continuous or batch measurements and moisture content through representative sampling to ensure the 90/10 confidence/precision level
QA/QC procedures:	
Any comment:	

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3
Description:	Biogas volume in year *y*
Source of data:	Measured
Measurement procedures (if any):	In all cases, the amount of biogas recovered, fuelled, flared or otherwise utilized (e.g. injected into a natural gas distribution grid or distributed via a dedicated piped network) shall be monitored *ex post*, using continuous flow meters. If the biogas streams flared and fuelled (or utilized) are monitored separately, the two fractions can be added together to determine the total biogas recovered, without the need to monitor the recovered biogas before the separation. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	Monitored continuously (at least hourly measurements are undertaken, if less, confidence/precision level of 90/10 shall be attained)
QA/QC procedures:	
Any comment:	

Data / Parameter:	$w_{CH4,y}$
Data unit:	%
Description:	Methane content in biogas in the year *y*
Source of data:	

Measurement procedures (if any):	The fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO_2 is not permitted. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place
Monitoring frequency:	
3. QA/QC procedures:	
Any comment:	-

Data / Parameter:	T
Data unit:	^{o}C
Description:	Temperature of the biogas
Source of data:	
Measurement procedures (if any):	The temperature of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	P
Data unit:	Pa
Description:	Pressure of the biogas
Source of data:	
Measurement procedures (if any):	The pressure of the gas is required to determine the density of the methane combusted. If the biogas flow meter employed measures flow, pressure and temperature and displays or outputs the normalised flow of biogas, then there is no need for separate monitoring of pressure and temperature of the biogas
Monitoring frequency:	Shall be measured at the same time when methane content in biogas ($w_{CH4,y}$) is measured
QA/QC procedures:	
Any comment:	

Data / Parameter:	η
Data unit:	%
Description:	Parameters related to emissions from electricity and/or fuel consumption in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares

Monitoring frequency:	
QA/QC procedures:	
Any comment:	

As per: "Emissions from Solid Waste Disposal Site"

Data / Parameter:	f_y
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*
Source of data:	Select a maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Measurement procedures (if any):	-
Monitoring frequency:	For the application A: Once for the crediting period (f_y – f) For the application B: Annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	W_x or W_i
Data unit:	t
Description:	Total amount of waste disposed in a SWDS in year *x* or month *i*
Source of data:	Measurements by project participants
Measurement procedures (if any):	Measure on a wet basis
Monitoring frequency:	Continuously, aggregated at least annually for year *x* or monthly for month *i*
QA/QC procedures:	
Any comment:	For application B

Data / Parameter:	$p_{n,j,x}$ or $p_{n,j,i}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample n collected during the year *x* or month *i*
Source of data:	Sample measurement by project participants
Measurement procedures (if any):	Sample the waste composition, using the waste categories *j*, as provided in the table for DOC_j and k_j, and weight each waste fraction (measure on wet basis)
Monitoring frequency:	Minimum of three samples every three months
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste type *j*. Sampling is not required if the waste comprises only one waste type.

Data / Parameter:	z_x
Data unit:	
Description:	Number of samples collected during year *x*
Source of data:	Project participants
Measurement procedures (if any):	Minimum of three samples every three months
Monitoring frequency:	Continuously, aggregated annually
QA/QC procedures:	
Any comment:	This parameter only needs to be monitored for application B, and if the waste includes more than one waste category *j*.

Data / Parameter:	d_y
Data unit:	m
Description:	Depth of the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well, that is also used to measure the height of the water table ($h_{w,y}$).
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	$h_{w,y}$
Data unit:	m
Description:	Height of the water table in the SWDS
Source of data:	Project participants
Measurement procedures (if any):	Monitoring well
Monitoring frequency:	Monthly, average annual values to be used in the case of application of the yearly model (equation (1))
QA/QC procedures:	-
Any comment:	This parameter needs to be monitored to identify whether the SWDS has a water table above the bottom of the SWDS, such as due to using waste to fill inland water bodies, such as ponds, rivers, or wetlands. If the SWDS does have a water table above the bottom of the SWDS, then the parameter is used to determine the MCF.

Data / Parameter:	a,b,c,d,e, g
Data unit:	%
Description:	Effect of the uncertainty of different parameters
Source of data:	Project participants
Measurement	Using the instructions in Table 3 in the methodological tool "Emissions from

procedures (if any):	solid waste disposal sites" (EB66 Annex 46).
Monitoring frequency:	Annually, if the conditions described in the "Instructions for selecting the factor" in table 3 in the methodological tool "Emissions from solid waste disposal sites" (EB66 Annex 46) have changed, (e.g. a change in how the weight of waste is measured). Once for the crediting period, if these conditions do not change.
QA/QC procedures:	-
Any comment:	Used in option 2 for determining the model correction factor.

From the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption"

Data / parameter:	$EF_{grid,CM,y}$
Data unit:	tCO2/MWh
Description:	Combined margin emission factor for the grid in year *y*
Source of data:	Calculate the combined margin emission factor, using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system"
Measurement procedures (if any):	As per the "Tool to calculate the emission factor for an electricity system"
Monitoring frequency:	As per the "Tool to calculate the emission factor for an electricity system"
QA/QC procedures:	As per the "Tool to calculate the emission factor for an electricity system"
Any comment:	Only applicable to scenarios A and C (cases C.I and C.III)

Data / parameter:	$TDL_{j,y}$ and $TDL_{k,y}$ and $TDL_{l,y}$
Data unit:	-
Description:	Average technical transmission and distribution losses for providing electricity to source *j*, *k* or *l* in year *y*
Source of data:	In case of scenario B and scenario C, case C.II, assume TDLj/k/l,y = 0 as a simplification. In case of other scenarios (scenario A and scenario C, cases C.I and C.III), choose one of the following options: • Use recent, accurate and reliable data available within the host country; • Use as default values of 20% for (e) project or leakage electricity consumption sources; (f) baseline electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is larger than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies. • Use as default values of 3% for (e) baseline electricity consumption sources; (f) project and leakage electricity consumption sources if the electricity consumption by all project and leakage electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies is smaller than the electricity consumption of all baseline electricity consumption sources to which scenario A or scenario C (cases C.I or C.III) applies.

Measurement procedures (if any):	For a): $TDL_{j/k/l,y}$ should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where the proposed CDM project activity is connected to. The technical distribution losses should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated by the project participants or be based on references from utilities, network operators or other official documentation.
Monitoring frequency:	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures:	
Any comment:	

Data / parameter:	$FC_{n,i,t}$
Data unit:	Mass or (normalized) volume unit per year (in m^3, ton or l)
Description:	Quantity of fossil fuel type *i* fired in the captive power plant *n* in the time period *t*
Source of data:	Annual data during the crediting period: Onsite measurements Historical data: Historical records / onsite measurements
Measurement procedures (if any):	Use weight or volume meters
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	Only applicable if option B1 is used.

Data / Parameter:	$EG_{n,t}$
Data unit:	MWh
Description:	Quantity of electricity generated in captive power plant *n* in the time period *t*
Source of data:	Onsite measurements
Measurement procedures (if any):	Use electricity meters
Monitoring frequency:	Continuously, aggregated at least annually
QA/QC procedures:	Cross check measurement results with records for sold electricity where relevant
Any comment:	Only applicable if option B1 is used

Data / parameter:	$HG_{n,t}$
Data unit:	GJ
Description:	Quantity of heat co-generated in captive power plant *n* in the period *t*
Source of data:	Onsite measurements
Monitoring frequency:	Use meters
Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot water generated minus the enthalpy of the feed-water and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.

QA/QC procedures:	Cross check measurement results with records for sold heat and the other energy measurements where relevant.
Any comment:	Only applicable if option B1 is used and if heat generation is not ignored (subject to the conditions outlined above)

Data / parameter:	$\eta_{boiler,y}$
Data unit:	-
Description:	Efficiency of the boiler in which heat is assumed to be generated in the absence
Source of data:	Choose among the following options:
Monitoring frequency:	e) Once at the start of the project activity f) Not applicable
Measurement procedures (if any):	e) Use national or international standards to determine the boiler efficiency f) Not applicable
QA/QC procedures:	-
Any comment:	Only applicable to option B1 and in cases where CO2 emissions from cogeneration are allocated to heat and power

Data / parameter:	NCVi,t	
Data unit:	GJ / mass or volume unit	
Description:	Average net calorific value of fossil fuel type *i* used in the period *t*	
Source of data:	The following data sources may be used if the relevant conditions apply:	
	Data source	**Conditions for using the data source**
	i) Values provided by the fuel supplier in invoices	This is the preferred source
	j) Measurements by the project participants	If a) is not available
	k) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy
	l) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards.
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall out this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Only applicable if option B1 is used

Data / parameter:	EFCO2,i,t
Data unit:	t CO2 / GJ
Description:	CO2 emission factor of fossil fuel type *i* used in the period *t*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	**Conditions for using the data source**
i) Values provided by the fuel supplier in invoices	This is the preferred source.
j) Measurements by the project participants	If a) is not available
k) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
l) IPCC default values at the upper or lower limit - whatever is more conservative[6] - of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available

Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average values for the period *t* should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account

Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, options b), c) or d) should be used.
QA/QC procedures:	
Any comment:	Only applicable if option B1 is used

From the "Tool to calculate project of leakage CO2 emissions from fossil fuel combustion"

Data / Parameter:	$FC_{i,j,y}$
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type *i* combusted in process *J* during the year *y*
Source of data:	Onsite measurements
Measurement procedures (if any):	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Continuously
QA/QC procedures:	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Any comment:	-

Data / Parameter:	$w_{C,i,y}$
Data unit:	tC/mass unit of the fuel
Description:	Weighted average mass fraction of carbon in fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for Using Data**
e) Values provided by the fuel supplier and invoices	This is the preferred source
f) Measurements	If a) is not available

	by the project participants |
Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The mass fraction of carbon should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	Verify if the values under a) and b) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in b) should have ISO17025 accreditation or justify that they can comply with similar quality standards.
Any comment:	Applicable where Option A is used

Data / Parameter:	$\rho_{i,y}$
Data unit:	Mass unit/volume unit
Description:	Weighted average density of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions applu:

Data Source	**Conditions for using the data**
a) Values provided by the fuel supplier	This is the preferred source
b) Measurements by the project participants	If a) is not available
c) Regional or national default values	If a) is not available. These sources can only be used for liquid fuels and should be based on well documents, reliable sources.

Measurement procedures (if any):	Measurements should be undertaken in line with national or international fuel standards
Monitoring frequency:	The density of the fuel should be obtained for each fuel delivery, from which weighted average annual values should be calculated
QA/QC procedures:	
Any comment:	Applicable where Option A is used and where $_{FCi.j.y}$ is measured in a volume unit. Preferably the same data source should be used for $_{wC,i,y}$ and $\rho i,y$.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ per mass or volume unit (e.g. GJ/m^3, GJ/ton)
Description:	Weighted average net calorific value of fuel type *i* in year *y*
Source of data:	The following data sources may be used if the relevant conditions apply:

Data Source	**Conditions for using the data**

	i) Values provided by the fuel supplier in invoices	This is the preferred source if the carbon fraction of the fuel is not provided (Option A)
	j) Measurements by the project participants	If a) is not available
	k) Regional or national default values	If a) is not available These sources can only be used for liquid fuels and should be based on well documented, reliable sources (such as national energy balances).
	l) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available
Measurement procedures (if any):	For a) and b): Measurements should be undertaken in line with national or international fuel standards	
Monitoring frequency:	For a) and b): The NCV should be obtained for each fuel delivery, from which weighted average annual values should be calculated For c): Review appropriateness of the values annually For d): Any future revision of the IPCC Guidelines should be taken into account	
QA/QC procedures:	Verify if the values under a), b) and c) are within the uncertainty range of the IPCC default values as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines. If the values fall below this range collect additional information from the testing laboratory to justify the outcome or conduct additional measurements. The laboratories in a), b) or c) should have ISO17025 accreditation or justify that they can comply with similar quality standards.	
Any comment:	Applicable where Option B is used	

Data / Parameter:	$EF_{CO2,j,y}$	
Data unit:	tCO_2/GJ	
Description:	Weighted average CO_2 emission factor of fuel type *j* in year *y*	
Source of data:	The following data source may be used if the relevant conditions apply:	
	Data Source	**Conditions for using the data source**
	i) Values provided by the fuel supplier in invoices	This is the preferred source
	j) Measurements by the project participants	If a) is not available
	k) Regional or national default	If a) is not available.

	values	This source can only be used for liquid fuels and should be based on well documented reliable sources (such as national energy balances)
	l) IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of the Chapter 1 of Vol. 2 (energy) of the 2006 IPCC Guidelines on National GHG Inventories	If a) is not available.
Measurement procedures (if any):	For a) and b), measurements should be undertaken in line with the national or international fuel standards.	
Monitoring frequency:	For a) and b): The CO2 emission factor should be obtained for each fuel delivery, from which weighted average annual values should be calculated. For c): Review appropriateness of the values annually	
QA/QC procedures:		
Any comment:	Applicable where option B is used. For a): If the fuel supplier does provide the NCV value and the CO2 emission factor on the invoice and these two values are based on measurements for this specific fuel, this CO2 factor should be used. If another source for the CO2 emission factor is used or no CO2 emission factor is provided, Options b), c) or d) should be used.	

Where applicable, AMS.I-C parameters to be monitored.

Data / Parameter:	
Data unit:	
Description:	Continuous operation of the equipment/ system
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	Annual check of all appliances or a representative sample thereof to ensure that they are still operating or are replaced by an equivalent in service appliance
QA/QC procedures:	
Any comment:	If the emissions reduction per system is less than five tonnes of CO_2e a year; or In the case of household or commercial applications/systems, whose maximum output capacity is less than 45 kW thermal and where it can be demonstrated that the metering of thermal energy output is not plausible: (i) Recording annually the number of systems operating (evidence of continuing operation, such as on-going rental/lease payments could be a substitute), if necessary using survey methods;

	(ii) Estimating the annual hours of operation of an average system, if necessary using survey methods. Annual hours of operation can be estimated from total output (e.g. tonnes of grain dried) and output per hour if an accurate value of output per hour is available. Where necessary refer to the "General guidelines for sampling and surveys for SSC project activities"

Data / Parameter:	EF_{CO2}
Data unit:	tCO_2e/kWh
Description:	CO_2 emission factor for the grid electricity in year *y*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	
QA/QC procedures:	
Any comment:	

Data / Parameter:	$EF_{CO2,i}$
Data unit:	tCO_2e/GJ
Description:	CO_2 emission factor of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"

Data / Parameter:	
Data unit:	MWh
Description:	Quantity of electricity generated/ supplied
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". In case the project activity is exporting electricity to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	

Data unit:	Nm^3/hr
Description:	Quantity of hot air
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts). Where it is not feasible (e.g. because of too high temperature), spot measurements can be used through sampling with a 90% confidence level and a 10% precision
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recordings
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Nm^3/hr
Description:	Quantity of steam
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies". If applicable, measurement results shall be cross checked with records for sold/purchased electricity (e.g. invoices/receipts)
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	TJ
Description:	Net quantity of thermal energy supplied by the project activity during the year *y*
Source of data:	

Measurement procedures (if any):	Heat generation is determined as the difference of the enthalpy of the steam or hot fluid and/or gases generated by the heat generation equipment and the sum of the enthalpies of the feed-fluid and/or gases blow-down and if applicable any condensate returns. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. In case of equipment that produces hot water/oil this is expressed as the difference in the enthalpy between the hot water/oil supplied to and returned by the plant. In case of equipment that produces hot gases or combustion gases, this is expressed as the difference in the enthalpy between the hot gas produced and all streams supplied to the plant. The enthalpy of all relevant streams shall be determined based on the monitored mass flow, temperature, pressure, density and specific heat of the gas. In case the project activity is exporting heat to other facilities, the metering shall be carried out at the recipient's end and measurement results shall be cross checked with records for sold/purchased thermal energy (e.g. invoices/receipts). Metering the energy produced by a sample of the systems where the simplified baseline is based on the energy produced multiplied by an emission coefficient
Monitoring frequency:	Continuous monitoring, aggregated annually
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	Mass or volume unit
Description:	Quantity of fossil fuel type *j* combusted in year *y*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	$B_{Biomass,y}$
Data unit:	Mass or volume
Description:	Net quantity of biomass consumed in year *y*
Source of data:	
Measurement procedures (if any):	Use mass or volume based measurements. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity of biomass shall be measured continuously or in batches. If more than one type of biomass fuel is consumed, each shall be monitored separately.

	For the case of processed renewable biomass (e.g. briquettes) data shall be collected for mass, moisture content, NCV of the processed biomass that is supplied to users with an appropriate sampling frequency. Cross-check: Cross-check the measurements with an annual energy balance that is based on purchased quantities (e.g. with sales receipts) and stock changes. In cases where emission reductions are calculated based on energy output, check the consistency of measurements *ex post* with annual data on energy generation, fossil fuels and biomass used and the efficiency of energy generation as determined *ex ante*
Monitoring frequency:	Continuously and estimate using annual mass/energy balance
QA/QC procedures:	
Any comment:	

Data / Parameter:	
Data unit:	%
Description:	Moisture content of the biomass (wet basis)
Source of data:	
Measurement procedures (if any):	On-site measurements. This applies in the case where emission reductions are calculated based on biomass energy input. For all cases, *ex ante* estimates should be provided in the PDD and used during the crediting period. In case of dry biomass, monitoring of this parameter is not necessary
Monitoring frequency:	The moisture content of biomass of homogeneous quality shall be monitored for each batch of biomass. The weighted average should be calculated for each monitoring period and used in the calculations
QA/QC procedures:	
Any comment:	

Data / Parameter:	*T*
Data unit:	°C
Description:	Temperature
Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	*P*
Data unit:	kg/cm^2
Description:	Pressure

Source of data:	
Measurement procedures (if any):	Measured using calibrated meters. Calibration shall be as per the relevant paragraphs of the "General guidelines to SSC CDM methodologies"
Monitoring frequency:	Continuous monitoring, integrated hourly and at least monthly recording
QA/QC procedures:	
Any comment:	

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type *i*
Source of data:	
Measurement procedures (if any):	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
Monitoring frequency:	As per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"
QA/QC procedures:	
Any comment:	

Data / Parameter:	NCV_k
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of biomass type *k*
Source of data:	
Measurement procedures (if any):	Measurement in laboratories according to relevant national/international standards. Measure quarterly, taking at least three samples for each measurement. The average value can be used for the rest of the crediting period. Measure the NCV based on dry biomass. Check the consistency of the measurements by comparing the measurement results with, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements)
Monitoring frequency:	Determine once in the first year of the crediting period
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-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
Postcode	8000
Country	Republic of South Africa
Telephone	+27 21 400 1910
Fax	+27 21 400 4846
E-mail	Waste.Review @capetown.gov.za
Website	https://www.capetown.gov.za/en/solidwaste/Pages/default.aspx
Contact person	Barry Coetzee
Title	Manager: Technical Strategic Support, Utility Services
Salutation	Mr.
Last name	Coetzee
Middle name	-
First name	Barry
Department	Utility Services Directorate
Mobile	+27 83 232 2861
Direct fax	+27 21 400 1910
Direct tel.	+27 21 400 4846
Personal e-mail	Barry.Coetzee@capetown.gov.za

Appendix 2: Affirmation regarding public funding

Appendix 3: Application of methodology(ies)

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

Appendix 5: Further background information on the monitoring plan

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
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