

Approved VCS Methodology

VM0018

Version 1.0

Sectoral Scopes 3, 13

Energy Efficiency and Solid
Waste Diversion Activities within
a Sustainable Community

Scope

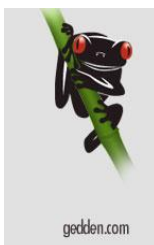
This methodology provides a procedure to determine the net CO₂, N₂O and CH₄ emissions reductions associated with grouped projects that focus on energy efficiency and solid waste diversion activities for an assortment of facilities within a set territory.

Methodology Developer

The methodology was developed by Will Solutions, Inc. (formerly Gedden Inc.), in collaboration with ICF Marbek and CertiConseil Inc.

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Relationship to Approved or Pending Methodologies

No approved or pending methodology under the VCS Program or an approved GHG program can reasonably be revised to meet the objective of this proposed methodology. All existing and pending VCS, CDM and CAR methodologies under sectoral scopes 3 and 13 have been reviewed. All corresponding methodologies have been grouped and listed below. None of the similar methodologies listed below could be revised without the addition of new procedures or scenarios to more than half of its sections.

Program	Sectoral Scope	Title	Similarity
CDM	3	<i>AM0025 - Avoided emissions from organic waste through alternative waste treatment processes</i>	Similar
CDM	3	<i>AM0041 - Mitigation of Methane Emissions in the Wood Carbonization Activity for Charcoal Production</i>	Not Similar
CDM	3	<i>AM0049 - Methodology for gas based energy generation in an industrial facility</i>	Not Similar
CDM	3	<i>AM0046 - Distribution of efficient light bulbs to households</i>	Not Similar
CDM	3	<i>AM0055 - Baseline and Monitoring Methodology for the recovery and utilization of waste gas in refinery facilities</i>	Not Similar
CDM	3	<i>AM0086- Installation of zero energy water purifier for safe drinking water application</i>	Not Similar
CDM	3	<i>AM0091- Energy efficiency technologies and fuel switching in new buildings</i>	Similar
CDM	3	<i>AM065 - Replacement of SF6 with alternate cover gas in the magnesium industry</i>	Not Similar
CDM	3	<i>AM0070 - Manufacturing of energy efficient domestic refrigerators</i>	Not Similar
CDM	3	<i>ACM003 - Emissions reduction through partial substitution of fossil fuels with alternative fuels or less carbon intensive fuels in cement manufacture</i>	Not Similar
CDM	3	<i>AM0007 - Analysis of the least-cost fuel option for seasonally-operating biomass cogeneration plants</i>	Not Similar
CDM	3	<i>AM0014 - Natural gas-based package cogeneration</i>	Not Similar
CDM	3	<i>ACM0012 - Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects</i>	Not Similar
CDM	3	<i>AM0024 - Methodology for greenhouse gas reductions through waste heat recovery and utilization for power generation at cement plants</i>	Not Similar

Program	Sectoral Scope	Title	Similarity
CDM	4	ACM0015 - Consolidated baseline and monitoring methodology for project activities using alternative raw materials that do not contain carbonates for clinker production in cement kilns	Not Similar
CDM	3	AM0020 - Baseline methodology for water pumping efficiency improvements --- Version 2.0	Not Similar
CDM	3	AM0044 - Energy efficiency improvement projects: boiler rehabilitation or replacement in industrial and district heating sectors --- Version 1.0	Similar
CDM	3	AM0060 - Power saving through replacement by energy efficient chillers --- Version 1.1	Similar
CDM	3	AM0068 - Methodology for improved energy efficiency by modifying ferroalloy production facility --- Version 1.0	Not Similar
CDM	3	AM0088 - Air separation using cryogenic energy recovered from the vaporization of LNG --- Version 1.0	Not Similar
CDM	3	AM0017 - Steam system efficiency improvements by replacing thermal energy traps and returning condensate --- Version 2.0	Similar
CDM	3	AM0018 - Baseline methodology for thermal energy optimization systems --- Version 2.2	Similar
CDM	3	AMS-I.I. - Biogas/biomass thermal applications for households/small users --- Version 1.0	Not Similar
CDM	3	AMS-II.C. - Demand-side energy efficiency activities for specific technologies --- Version 13.0	Similar
CDM	3	AMS-II.F. - Energy efficiency and fuel switching measures for agricultural facilities and activities --- Version 9.0	Similar
CDM	3	AMS-II.G. - Energy Efficiency Measures in Thermal Applications of Non-Renewable Biomass --- Version 2.0	Not Similar
CDM	3	ACM0005 - Consolidated Baseline Methodology for Increasing the Blend in Cement Production --- Version 5.0	Not Similar
CDM	3	AMS-III.B. - Switching fossil fuels --- Version 15.0	Similar
CDM	3	AMS-II.E. - Energy efficiency and fuel switching measures for buildings	Similar
CDM	3	AMS-II.J. - Demand-side activities for efficient lighting technologies	Similar
CDM	3	AMS-II.K. - Installation of co-generation or tri-generation systems supplying energy to commercial building	Not Similar

Program	Sectoral Scope	Title	Similarity
CDM	3	AMS-II.L. - Demand-side activities for efficient outdoor and street lighting technologies	Similar
CDM	3	AMS-II.M. - Demand-side energy efficiency activities for installation of low-flow hot water savings devices	Similar
CDM	3	AMS-III.AE. - Energy efficiency and renewable energy measures in new residential buildings	Similar
CDM	3	AMS-III.AL. - Conversion from single cycle to combined cycle power generation	Similar
CDM	3	AMS-III.AV. - Low greenhouse gas emitting water purification systems	Similar
CDM	3	AMS-III.X. - Energy Efficiency and HFC-134a Recovery in Residential Refrigerators	Not Similar
CDM	13	AM0039 - Methane emissions reduction from organic waste water and bioorganic solid waste using co-composting	Similar
CDM	13	AM0057 - Avoided emissions from biomass wastes through use as feed stock in pulp and paper production or in bio-oil production	Similar
CAR	13	CAR - Organic Waste Composting Project Protocol	Similar
CDM	13	AM0073 - GHG emission reductions through multi-site manure collection and treatment in a central plant	Not Similar
CDM	13	AM0083 - Avoidance of landfill gas emissions by in-situ aeration of landfills	Not Similar
CDM	13	ACM0014 - Mitigation of greenhouse gas emissions from treatment of industrial wastewater	Not Similar
CAR	13	CAR - Landfill Project Protocol	Not Similar
CDM	13	AMS-III.AJ. - Recovery and recycling of materials from solid wastes	Similar
CDM	13	AM0025 - Avoided emissions from organic waste through alternative waste treatment processes	Similar
CDM	13	AM0073 - GHG emission reductions through multi-site manure collection and treatment in a central plant	Not Similar
CDM	13	ACM0001 - Consolidated baseline and monitoring methodology for landfill gas project activities	Similar
CDM	13	ACM0010 - Consolidated baseline methodology for GHG emission reductions from manure management systems	Not Similar

Program	Sectoral Scope	Title	Similarity
CDM	13	ACM0014 - Mitigation of greenhouse gas emissions from treatment of industrial wastewater	Not Similar
CDM	13	AMS-III.G. - Landfill methane recovery	Similar
CDM	13	AMS-III.H. - Methane recovery in wastewater treatment	Not Similar
CDM	13	AMS-III.AF. - Avoidance of methane emissions through excavating and composting of partially decayed municipal solid waste (MSW)	Not Similar
CDM	13	AMS-III.L. - Avoidance of methane production from biomass decay through controlled pyrolysis	Not Similar
CDM	13	AMS-III.AO. - Methane recovery through controlled anaerobic digestion	Not Similar
CDM	13	AM0039 - Methane emissions reduction from organic waste water and bioorganic solid waste using co-composting	Not Similar
CDM	13	AM0057 - Avoided emissions from biomass wastes through use as feed stock in pulp and paper, cardboard, fiberboard or bio-oil production	Not Similar
CDM	13	AM0080 - Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater treatment plants	Not Similar
CDM	13	AM0083 - Avoidance of landfill gas emissions by in-situ aeration of landfills	Not Similar
CDM	13	AM0093 - Avoidance of landfill gas emissions by passive aeration of landfills	Not Similar
CDM	13	AMS-III.E. - Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/ thermal treatment	Similar
CDM	13	AMS-III.F. - Avoidance of methane emissions through controlled biological treatment of biomass	Not Similar
CDM	13	AMS-III.I. - Avoidance of methane production in wastewater treatment through replacement of anaerobic systems by aerobic systems	Not Similar
CDM	13	AMS-III.Y. - Methane avoidance through separation of solids from wastewater or manure treatment systems	Not Similar
CDM	13	ACM0001 - Consolidated baseline and monitoring methodology for landfill gas project activities	Similar
CDM	13	ACM0010 - Consolidated baseline methodology for GHG emission reductions from manure management systems	Not Similar

Program	Sectoral Scope	Title	Similarity
CDM	13	<i>ACM0014 - Mitigation of greenhouse gas emissions from treatment of industrial wastewater</i>	Not Similar
VCS	3	<i>Methodology for Weatherization of Single Family and Multi-family Buildings</i>	Similar

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1 SOURCES

These documents have been drawn upon heavily in the development of this methodology. Throughout the text the short form reference (PUBLISHER, YEAR) will be used to indicate areas where the sources were drawn upon most heavily.

This methodology complies with the principles of:

- *ISO 14064: Part 2*, “Specification with guidance at the project level for the quantification, monitoring and reporting of greenhouse gas emission reductions and removal enhancements” (ISO, 2006).
- VCS, *VCS Standard*, Version 3 (VCS, Version 3)

This methodology also draws ideas from the latest approved version of the following CDM tools:

- CDM, *Tool to Calculate the Emission Factor for an Electricity System* (Version 2.2.0) (CDM, 2011) and
- CDM, *Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality* (Version 3.0.1) (CDM, 2011).

The energy efficiency approach within has been based on elements of the following methodologies:

- Direct Energy's, *GHG Quantification Protocol for Energy Efficiency in Commercial and Institutional Buildings* (Direct Energy, 2009);
- Alberta Offset System, Protocol, *GHG Quantification Protocol for Energy Efficiency in Commercial and Institutional Buildings* (AENV, 2010);
- Alberta Offset System, Protocol, *Quantification Protocol For Energy Efficiency Projects* (Version 01) (AENV, 2007);
- IPMVP - Efficiency Valuation Organization (EVO-1000-1, 2010) in its International Performance Measurement and Verification Protocol (IPMVP) (www.evo-world.org) for guidance on methods determining energy savings.¹

This waste diversion approach within has been based on elements of the following methodologies:

- CDM, AM0039, *Methane Emissions Reduction from Organic Waste Water and Bioorganic Solid Waste using Co-composting* (Version 02) (CDM, 2007).
- CDM, *Tool to Determine Methane Emissions Avoided from Disposal of Waste at a Solid Waste Disposal Site* (Version 6.0) (CDM, 2011)
- CCX “Avoided Emissions from Organic Waste Disposal Offset Project Protocol” (CCX, 2009);

¹ IPMVP is a recognized international standard for measuring, monitoring, and verifying energy savings.

2 SUMMARY DESCRIPTION OF THE METHODOLOGY

This methodology provides a framework for the quantification of emission reductions for grouped projects², where energy efficiency and solid waste diversion activities have been initiated by a Sustainable Community Service Promoter for an assortment of Client Facilities grouped in a Territory. This methodology requires that the SCSP uses a consolidated, Information and Communication Technology-enabled data monitoring and collection system to track project activity data. Even though the activities of Client Facilities vary, energy consumption and waste management are similar across many businesses and organizations. This methodology is meant to work with and support the provision of single window reporting and measurement provided by a third party to capture the information required to quantify emissions reductions.

3 DEFINITIONS

This sub-section introduces important terminology to ensure the project proponent and validation/verification bodies (VVBs) share common understandings of the various roles, parties and grouping systems involved in this methodology.

Client Facility	A large range of small companies or business units that contract the Sustainable Community Service Promoter to manage their GHG emitting services. Client Facilities may include commercial, institutional, residential and industrial buildings/facilities including but not limited to warehouses, apartment buildings, hotels, restaurants, educational buildings, shopping malls, food manufacturing plants, chemical manufacturing facilities, and light industrial plants. Client Facilities are typically located in regional or state clusters.
Sustainable Community (SC)	A Sustainable Community is as a collection of Client Facilities that have undertaken common actions (usually initiated by the SCSP) to reduce their overall GHG emissions.

² See *VCS Standard* for grouped project requirements.

Sustainable Community Service Promoter (SCSP)	An independent entity, which acts as the project proponent, providing essential consultation services in the fields of energy and waste to Client Facilities to stimulate greenhouse gas (GHG) reduction activities. SCSPs add value to Client Facilities by implementing Information and Communication Technology-enabled electronic tracking platforms, monitoring technologies, and emission reduction activities. In providing services to Client Facilities, SCSPs contractually maintain ownership of the environmental attributes associated with actions that reduce the Client Facilities overall GHG emissions.
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Territory	A grouping of Client Facilities which belong to a common industrial or geographic cluster, where the regional conditions (i.e. electricity source, climate, waste processing schemes, etc.) and regulations (i.e. waste and emission regulations, etc.) are similar for the different facilities; where homogeneous emission factors for fossil combustibles and identifiable emission factor for the electricity grid can be applied; and where common energy efficiency activities and waste processing activities are possible. The Territory concept has been applied to facilitate VVB sampling procedures, though sampling resolutions are ultimately to be determined by the VVB based on a risk assessment of the project and project controls.
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This sub-section introduces data, sampling, and conceptual terminologies that are important to how emission reductions are quantified and monitored under this methodology.

Baseline Adjustments	The non-routine adjustments arising during the monitoring period from changes in: 1) any energy governing characteristic of the facility within the measurement boundary, except the named independent variables used for routine adjustments (EVO 10000-1, 2010); or 2) any waste governing characteristic of the facility within the measurement boundary (for example, total production).
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Baseline Period	The period of time chosen to represent operation of the facility or system before implementation of an Energy Conservation Measure or waste reduction/diversion activities. This period may be as short as the time required for an instantaneous measurement of a constant quantity, or long enough to reflect one full operating cycle of a system or facility with variable operations.
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Confidence Interval	A confidence interval (CI) is a particular kind of interval estimate of a population parameter and is used to indicate the reliability of an estimate. It is an observed interval (i.e. it is calculated from the observations), in principle different from sample to sample, that frequently includes the parameter of interest, if the experiment is repeated. How frequently the observed interval contains the parameter is determined by the confidence interval or confidence coefficient.
Estimate	A process of determining a parameter used in a savings calculation through methods other than measuring it in the baseline and monitoring periods. These methods may be based on secondary data or engineering assumptions and estimates derived from manufacturer's rating of equipment performance. Equipment performance tests that are not made in the place where they are used during the monitoring period shall be considered as estimates.
Facility	The collection of units, excluding the Project Unit. As such, the greenhouse emissions from the facility are defined to remain constant as only the Project Unit is impacted by the project. Where the Project Unit encompasses the entire site, there may be no components defined as the Facility at the site.
Functional Equivalence	The project and the baseline shall provide the same function and quality of products or services. This type of comparison requires a common metric or unit of measurement (such as the mass of cardboard diverted from landfill for mass of finished furniture, energy use/per unit of product) for comparison between the project and baseline activity.
Information and Communication Technology (ICT)	Information and Communication Technology that is applied through an electronic tracking platform for each Client Facility. An electronic account and the effective electronic link between all Client Facilities inside a Territory to stimulate, to support and measure their GHG related activities. SCSPs employ an ICT-enabled GHG monitoring system.

Measurement Boundary	A notional boundary drawn around equipment and/or systems to segregate those which are relevant to savings determination from those which are not. All energy uses of equipment or systems within the measurement boundary must be measured or estimated, whether the energy uses are within the boundary or not (EVO 10000-1, 2010)
Non-Routine Adjustments	Calculations that account for changes in Static Factors within the measurement boundary since the baseline period. Examples of changes in Static Factors that require non-routine adjustments include the facility size, product types, building envelope characteristics, indoor environment and occupancy characteristics. Non-routine adjustments applied to the baseline are sometimes referenced as “baseline adjustments” (EVO 10000-11, 2010). For this quantification protocol, non-routine adjustments also account for changes in the “surplus” characteristics of the project.
Primary Data	Observed data from specific facilities linked to the SCSP tracking system.
Project Unit	A project activity instance wherein the equipment, processes and facilities are being serviced and impacted by the energy efficiency and waste diversion processing project. The Project Unit must be clearly defined and justified by the project proponent. All non-Project Unit items are covered under the heading of facility operation.
Routine Adjustments	The calculations made by a formula, as shown in the energy efficiency and waste diversion monitoring plans, to account for changes in selected independent variables within the measurement boundary since the baseline period (EVO 10000-11, 2010), not including any changes to Static Factors.
Secondary Data	Generic- or industry-average data from published sources that are representative of Project unit Activities and Client Facility products.
Static Factors	Those characteristics of a Client Facility which affect energy use and waste volume produced, within the chosen measurement boundary. These characteristics include fixed, environmental, operational and maintenance characteristics. They may be constant or varying (EVO 10000-11, 2010).

Standard Deviation	The standard deviation, denoted by s and is defined as follows: $s = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2},$ where $\{x_1, x_2, \dots, x_N\}$ are the observed values of the sample items and $\bar{x}$ is the mean value of these observations.
Suggested Sample Size	While the ultimate level of sampling must be determined by the VVB, the project proponent may provide a suggested number of Sustainable Community Project Units to be physically verified.
Unit of Productivity	The unit of productivity is to be defined by the project proponent as a basis for incorporating Functional Equivalence within the calculation methodology. Examples of units of productivity could be: energy requirements for residential buildings, per square foot of front of house commercial space, per kg/L/m²/m³ of output from manufacturing facilities, etc. The unit of productivity shall be defined to account for any non-production sensitive components. In all cases the project proponent must thoroughly justify their assessment of the appropriate unit of productivity.
Verified Data Feedback Loop	After each verification cycle, verified SCSP Client Facility data may be used to increase the confidence interval on any estimated values included in the baseline or project scenarios. Examples of such situations could include replacing regional factors for a specific facility with a more accurate waste or energy profile of the specific Client Facility based on measured data, providing it can still be related to the baseline period. This verified data feedback loop could ultimately result in adjustments that both increase or decrease emission reduction assertions in future years. The adjustments would not be retroactive to previously serialized offsets.
These definitions apply to the energy efficiency components of GHG quantification described herein.	
Adjusted-baseline energy	The energy use of the baseline period, adjusted to a different set of operating conditions (EVO 10000-11, 2010).
Baseline Energy	The energy use occurring during the baseline period without adjustments (EVO 10000-11, 2010).

Cycle	The period of time between the start of successive similar operating modes of a facility or piece of equipment whose energy use varies in response to operating procedures or independent variables. For example, the cycle of most buildings is 12 months, since their energy use responds to outdoor weather which varies on an annual basis. Another example is the weekly cycle of an industrial process which operates differently on Sundays than during the rest of the week (EVO 10000-11, 2010).
Energy Conservation Measure (ECM)	An activity or set of instances designed to increase the energy efficiency of a facility, system or piece of equipment. ECMs may also conserve energy without changing efficiency. Several ECMs may be carried out in a facility at one time, each with a different thrust. An ECM may involve one or more of: physical changes to facility equipment, revisions to operating and maintenance procedures, software changes, or new means of training or managing users of the space or operations and maintenance staff. An ECM may be applied as a retrofit to an existing system or facility, or as a modification to a design before construction of a new system or facility.

These definitions apply to the waste diversion components of GHG quantification described herein.

Alternative Processing	Refers to recycling, reusing, reduction and re-processing activities which are applied as part of the project to divert waste from reaching a landfill.
Biodegradability	Biodegradability is the capability of a substance to break down into simpler substances, especially into innocuous products, by the actions of living organisms (that is, microorganisms).
Composting	The process of collecting, grinding, mixing, piling, and supplying sufficient moisture and air to organic materials to speed natural decay. The finished product of a composting operation is compost, a soil amendment suitable for incorporating into topsoil and for growing plants. Compost is different than mulch, which is a shredded or chipped organic product placed on top of soil as a protective layer.
Destinations	The ultimate destination for waste being shipped by the project. This is the location where the waste would be unloaded from a truck after having been shipped from project Origins.

Disposal	Final stage in the management of waste, which includes: treatment of waste prior to disposal, incineration of waste, with or without energy recovery, deposit of waste to land or water, discharge of liquid waste to sewer, and permanent, indefinite or long term storage of waste.
Diversion	For waste measurement purposes, diversion is any combination of waste prevention (source reduction), recycling, reuse and composting instances that reduces waste disposed at authorized landfills and transformation facilities.
Landfill Gas (LFG)	Gas generated by biological decomposition of waste material in a landfill. The gas is typically comprised of methane, carbon dioxide, other trace gases and water vapor.
Origins	Starting points for waste being shipped by the project. This is the location where the waste would be loaded onto a truck or train for ultimate delivery to Destinations.
Producer	Refers to the Client Facility that produces the waste to be disposed of.
Process Emissions	Process emissions are direct emissions from sources directly associated with production that involve chemical or physical reactions, other than combustion, and where the primary purpose of the process is not energy production.
Recycling	The process of collecting, sorting, cleansing, treating, and reconstituting materials that would otherwise become solid waste, and returning them to the economic mainstream in the form of raw material for new, reused, or reconstituted products that meet the quality standards necessary to be used in the marketplace.

Waste	All type of wastes, regulated or not regulated, hazardous or non-hazardous and generated by citizens under the municipal umbrella (Municipal Solid Waste (MSW)) or by others sources such as an Industrial, Commercial and Institutional (ICI) business unit. This definition of the wastes defined by the Basel Convention http://www.basel.int/ in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal in the article 2 and referred to Annex I and II, shall apply for all types of wastes. Notice this UN international convention respect the full right of country to define their wastes (article 2 item 1).
Waste Transformation	Incineration, pyrolysis, distillation, gasification, or biological conversion other than composting.
Waste Management	All types of waste management operations, disposal and recycling applied for all types of wastes shall refer to the definition used by the Basel Convention http://www.basel.int/ in the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal in article 2 and referred to Annex IV. Notice this UN international convention respect the full right of country to define their management wastes operations (article 2).

4 APPLICABILITY CONDITIONS

This methodology is applicable for grouped projects for the quantification of direct and indirect reductions of GHG emissions arising from energy efficiency and waste management project activity instances at client facilities (project units).

The requirements of this methodology have been designed to meet micro energy efficiency and/or waste diversion project units where the maximum emission reductions from an individual project unit is 5,000 tCO₂e/year. Therefore, through a combination of energy efficiency and waste management activities, project units within a grouped project could have a maximum combined abatement threshold of 10,000 tCO₂e/year. While each client facility, or project unit, may only contribute a modest abatement (10,000 tCO₂e/year or less), the total sum of abatement from all project units within this entire grouped project may exceed the combined threshold of 10,000 tCO₂e/year.

This methodology is applicable for grouped projects for the quantification of direct and indirect reductions of GHG emissions arising from energy-efficiency and waste-diversion projects at client facilities. Projects can be located in residential, commercial, institutional, or industrial buildings/facilities. The project proponent must demonstrate right of use in respect of the project's GHG emission reductions, which may, for example, entail securing right of use from client facilities.

Energy Efficiency

This methodology is applicable to ECMs where the project activity is the construction of new facilities, the retrofit of existing facilities, or process/management changes of existing facilities that result in a reduction of energy use per unit of productivity. The ECMs must occur in conjunction with the following:

- Building envelope modifications
- Heating, ventilation and air conditioning (HVAC)
- Heat generation (including industrial thermal energy systems)
- Chilling/cooling systems
- Lighting and lighting control
- Building mechanical infrastructure
- Appliances and industrial processes (including heating and cooling requirements and process modification)
- Electric motors
- Equipment optimization

The following guidance provides further clarification on energy efficiency activities, approach and applicability:

- a. The project proponent must document the useful life of the ECMs and the remaining useful life of the existing baseline equipment and ensure that the project unit(s) is not credited beyond the useful life of the ECM or remaining useful life of the existing technology in the baseline scenario. If capital stock equipment that was originally measured in the baseline for a given project crediting period is replaced during a project crediting period, it can only be considered additional, and in turn be able to generate GHG credits, if it was retired prior to its natural capital stock rotation as indicated in the initial documentation of useful life. If capital stock enters the end of its useful life prior to the end of a project crediting period and is replaced, any emission reduction attributable to this replacement technology must not be considered towards generating credits, and shall lower the facility baseline by a sum equal to the difference in emissions between the previous capital stock equipment and the replacement capital stock equipment.
- b. By reducing energy consumption, applicable projects will reduce GHG emissions associated with the conversion of primary energy sources to secondary forms of energy (e.g., electricity, heat, mechanical energy, etc.).
- c. This methodology is also applicable to activities generating GHG emission reductions related to improvements in combustion efficiency³. This applies to projects involving switching from one energy generation method to a less GHG-intensive energy generation method. In this case, this methodology only quantifies emissions reductions from fuel switching that occur within the project boundary. Fuel switching associated with large energy suppliers, which

³ There must not be double counting between activities related to improvements in combustion efficiency and any energy efficiency activities within the project.

have emission reductions that exceed the established threshold of this methodology, are not intended to be quantified using this protocol. Only small on-site power sources, with emission reductions within the threshold limit of this methodology, are applicable for inclusion within the methodology. This separation of large offsite generation and the project removes risk of double counting. A net emission reduction and efficiency improvement would be achieved by such activities so long as a net reduction in overall greenhouse gas emissions per unit of productivity is achieved. The production of energy, particularly from fossil energy sources, has significant associated GHG emissions (typically combustion-related), including both direct and indirect sources.

- d. Biological or chemical components of the operation must not yield any increase in non-biogenic greenhouse gas emissions compared to the baseline scenario, unless these are accounted for under the applicable flexibility mechanisms as indicated by an affirmation from the project proponent.

Waste Diversion

This methodology is applicable where the project activity is the diversion of waste for other productive uses and alternative disposal options. This methodology is only applicable to quantify emission reductions associated with methane avoidance. This methodology is not approved for quantifying emission reductions associated with landfill gas flaring or electricity/energy production. This methodology is applicable to the following activities:

- Card board recycling
- Organic composting
- Aerobic decomposition

5 PROJECT BOUNDARY

5.1 Project

The project proponent shall identify all GHG sources and sinks (SS) relevant to the project such as:

- Production of electricity
- Maintenance, construction and decommissioning
- Decomposition of solid waste in landfills.

The process set out in Diagram 1 identifies, illustrates and organizes SS for a typical project applicable under this methodology. Table 1 describes each SS identified in Diagram 1, discusses the SS relevance and characterizes the SS as controlled, related or affected by the project activity.

Since this methodology has been written to work for various types of project activities, one single project boundary cannot be provided. The project proponent shall use the requirements set out in this section to clearly define the most appropriate boundary for each grouping of client facilities with appropriate

justifications for the inclusion or exclusion of SS. This shall include unique geo-coordinates if the projects are implemented across several dispersed locations.

For energy efficiency activities, it is important to note that the site boundaries are determined by whether the project proponent elects to quantify using “Option A – Isolation Parameter Measurement” or “Option B – Whole Facility Measurement.”

If Option A, Isolation Parameter Measurement, is selected, savings are determined by measuring the energy use of the ECM affected system, rather than the entire building. As such the boundary chosen is the ECM affected system. In this case, clear justification must be provided at the Territory level by the project proponent that the ECM affected system would have no material impact on the operation and emissions of the whole or remaining facility. Functional equivalence and unit of productivity adjustments for the ECM affected system must be made to the baseline of the system.

If Option B, Whole Facility Measurement, is selected, energy use for the entire facility is measured and any savings are calculated accordingly and therefore the boundary chosen is the entire facility. In this case, clear justification must be provided at the Territory level by the project proponent that the entire building’s baseline meets functional equivalence and has been adjusted by units of productivity.

Regardless of which option is selected, the project energy use calculations shall be done according to the methodology documents in IPMVP’s “Concepts and Options for Determining Energy and Water Savings (Volume 1)” (EVO, 2010). For waste diversion activities, the project proponent must use “Whole Facility Measurement” to determine the site boundaries. This means that if the project proponent is including waste diversion activities, then an isolated component of the facility cannot be used, the entire facility’s facility and waste stream must be included in the boundary. The project and baseline element life cycle charts are shown in Diagrams 1 and 2, respectively. Project documentation shall include diagrams that disclose the locations and processes of metering equipment used in determining the mass energy flows.

Diagram1: Project Element Life Cycle Chart

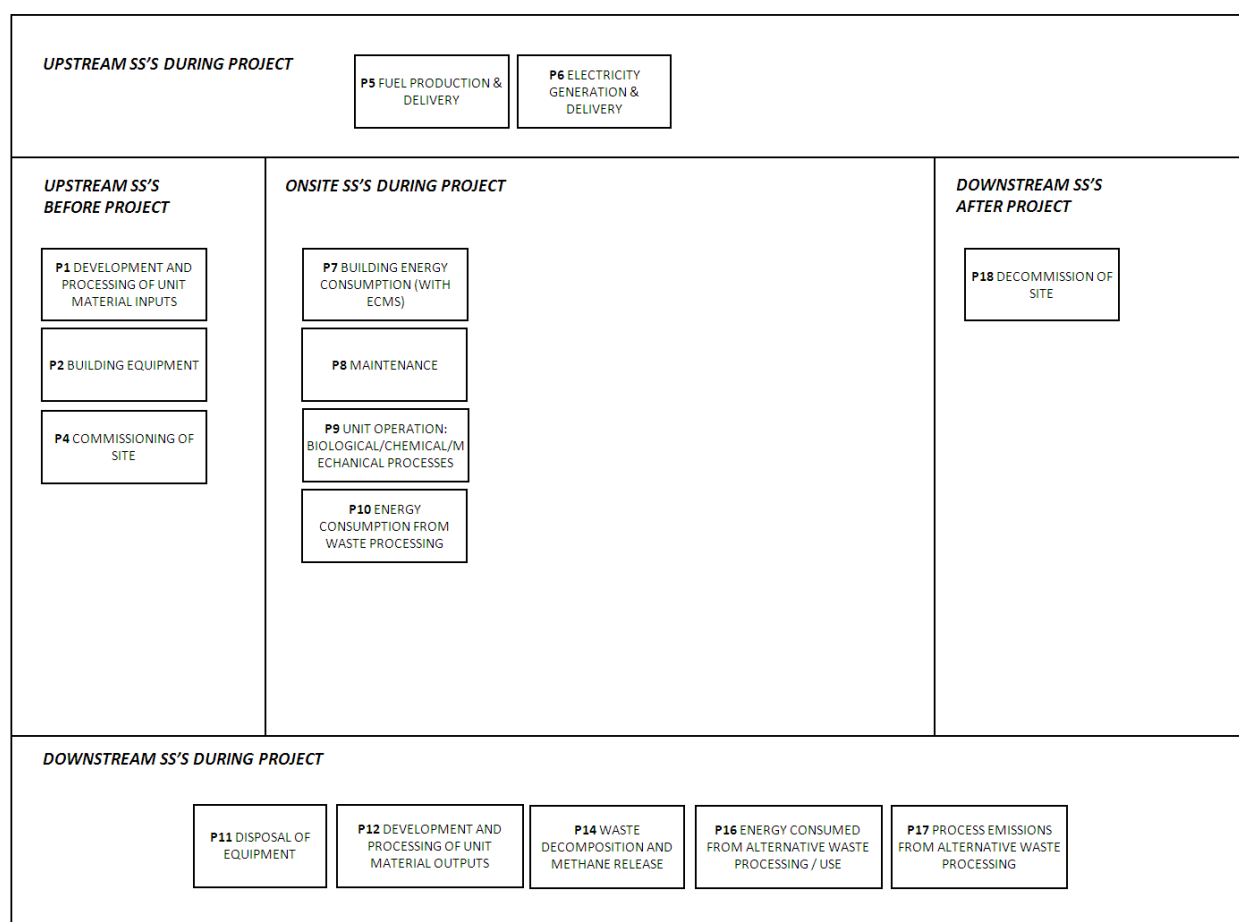


Table 1: Project Life Cycle SS Descriptions

SS	Description	Controlled, Related or Affected
Upstream Before Project		
P1 Development and Processing of Unit Material Inputs	The material inputs to the unit process need to be transported, developed and/or processed prior to the unit process. This may require any number of mechanical, chemical or biological processes. All relevant characteristics of the material inputs would need to be tracked to prove functional equivalence with the baseline scenario.	Related
P2 Building Equipment	GHG emissions arise from the manufacturing process of the equipment to implement the ECMs and conventional building/facility operation in the project. Such emissions are likely associated with the fossil fuels and electricity consumed during the manufacturing process.	Related

P4 Commissioning of Site	The development of the site (technically onsite before project) and installation of equipment result in GHG emissions, primarily from the use of fossil fuels and electricity during this process.	Related
Upstream During Project		
P5 Fuel Production & Delivery	The production and distribution of fuel used during building/facility operations result in GHG emissions. The volume and type of fuel shall be required for GHG emission calculations, as is the distribution distance.	Related
P6 Electricity Generation & Delivery	Building/facility operations could require significant amounts of electricity. The generation and distribution of electricity results in GHG emissions.	Related
Onsite During Project		
P7 Building/System Energy Consumption (with ECMs)	Energy (including fossil fuel and electricity) is likely required on-site to operate the building/facility. Equipment utilizing this energy could include boilers, lighting systems, HVAC Systems, ventilation systems, equipment, etc.	Controlled
P8 Maintenance	The facility and systems within the facility likely requires maintenance. GHG emissions arise from the use of fuels and electricity in maintenance procedures.	Controlled
P9 Unit Operation: Biological/Chemical /Mechanical Processes	Greenhouse gas emissions may occur that are associated with the operation and maintenance of the biological processes (biological, chemical, and mechanical) within the unit at the project site. All relevant characteristics of the biological processes would need to be identified.	Controlled
P10 Energy Consumption from Waste Processing	Energy may be required to power waste processing or handling equipment (i.e. compacters, etc.)	Controlled
Downstream During Project		
P11 Disposal of Equipment	The disposal of some materials/equipment which compose all or a component of the ECM or waste diversion systems may result in GHG emissions.	Related
P12 Development and Processing of Unit Material Outputs	The material outputs from the unit process need to be transported, developed, and/or processed subsequent to the unit process. This may require any number of mechanical, chemical or biological processes. All relevant characteristics of the material outputs would need to be identified to prove functional equivalence with the baseline scenario.	Related

P14 Waste Decomposition and Methane Release	Waste may decompose in the disposal facility (typically a landfill site) resulting in the production of methane. A methane collection and destruction system may be in place at the disposal site. If such a system is active in the landfill or the area of the landfill where this material is being disposed, then its characteristics must be identified and the efficiency (ie, percent of total methane generation that is capture and destroyed) must be accounted for in a reasonable manner. Disposal site characteristics, mass disposed at each site, and methane collection and destruction system characteristics may need to be identified.	Related
P16 Energy Consumed from alternative processing of waste/use	Energy may be consumed by the alternative processing waste diversion activity. The related energy inputs for fueling this equipment are identified under this SS, for the purpose of calculating the resulting GHG emissions.	Related
P17 Process Emissions from Alternative Processing of Waste	This SS encompasses any process emissions associated with the new method of handling waste. Any process emissions related to the alternative use or disposal of the solid waste must be measured or estimated. All relevant characteristics of these processes would need to be identified.	Related
Downstream After Project		
P12 Decommission of Site	Once the facility is no longer operational, the site may need to be decommissioned. This may involve the disassembly of the equipment, demolition of on-site structures, disposal of some materials, environmental restoration, re-grading, planting or seeding, and transportation of materials off-site. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to decommission the site.	Related

5.2 Baseline

All SS relevant to the baseline, including on-site, upstream and downstream SS shall be identified.

The process set out in Diagram 2 identifies, illustrates and organizes SS for a typical baseline applicable under this methodology. Table 2 describes each SS identified in Diagram 2, discusses the SS relevance and characterizes the SS as controlled, related, or affected by the project activity.

Diagram 2: Baseline Life Cycle Chart

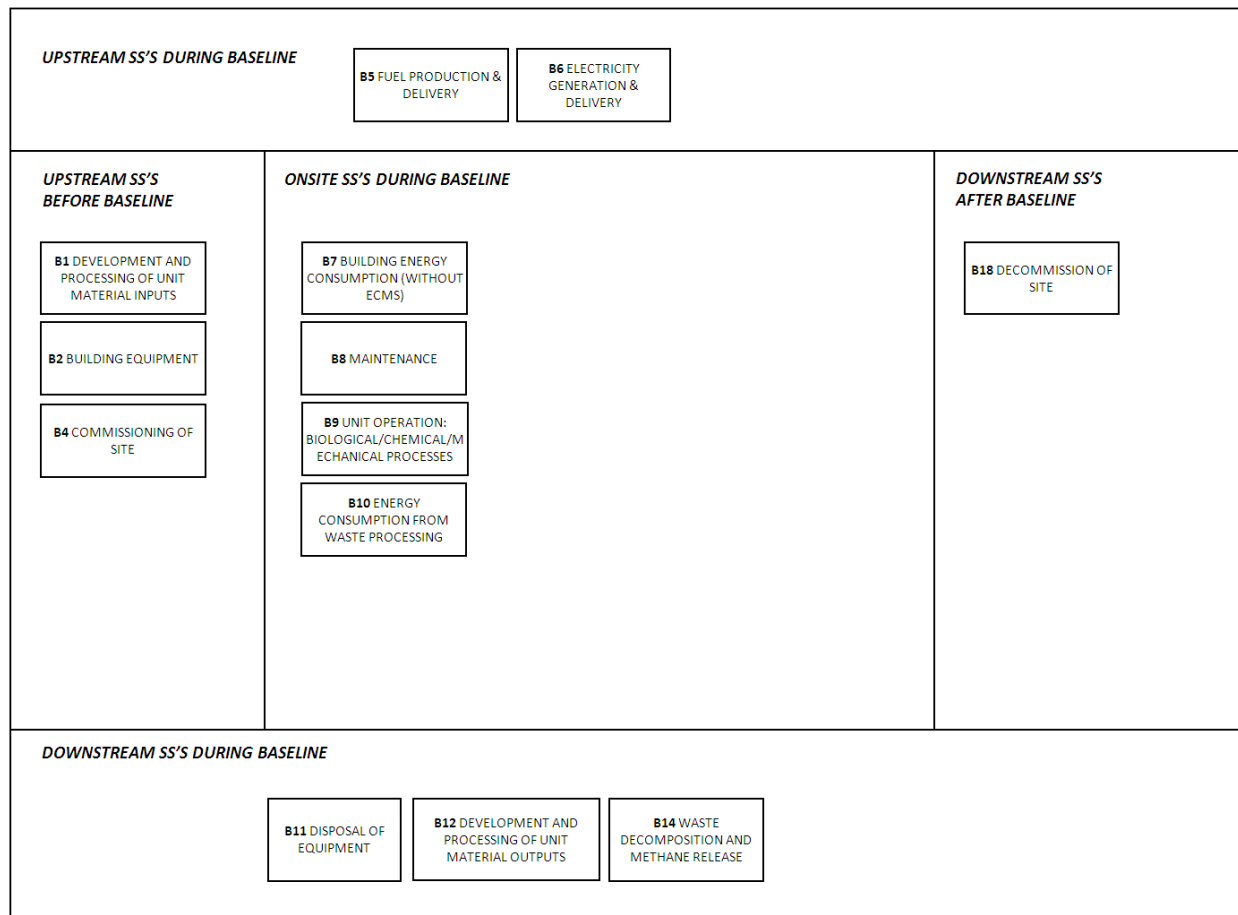


Table 2: Baseline Element Life Cycle SS Descriptions

SS	Description	Controlled, Related or Affected
Upstream During Baseline		
B1 Development and Processing of Unit Material Inputs	The material inputs to the unit process need to be transported, developed and/or processed prior to the unit process. This may require any number of mechanical, chemical or biological processes. All relevant characteristics of the material inputs would need to be identified to prove functional equivalence with the baseline scenario.	Related
B2 Building Equipment	GHG emissions arise from the manufacturing process of the equipment to implement the ECMs and conventional building/facility operation in the project. Such emissions are likely associated with the fossil fuels and electricity consumed during the manufacturing process.	Related
B4 Commissioning of Site	The development of the site (before project) and installation of equipment results in GHG emissions, primarily from the use of fossil fuels and electricity during this process.	Related
Upstream Before Baseline		
B5 Fuel Production & Delivery	The production and distribution of fuel used during building/facility operations results in GHG emissions. The volume and type of fuel shall be required for GHG emission calculations, as is the distribution distance.	Related
B6 Electricity Generation & Delivery	Building/facility operations could require significant amounts of electricity. The generation and distribution of electricity results in GHG emissions.	Related
Onsite During Baseline		
B7 Building/System Energy Consumption (without ECMs)	Energy (including fossil fuel and electricity) is likely required on-site to operate the building/facility. Equipment utilizing this energy could include boilers, lighting systems, HVAC Systems, ventilation systems, equipment, etc.	Controlled
B8 Maintenance	The facility and systems within the facility likely requires maintenance. GHG emissions arise from the use of fuels and electricity in maintenance procedures.	Controlled
B9 Unit Operation: Biological/Chemical/Mechanical Processes	GHG emissions may occur that are associated with the operation and maintenance of the biological processes (biological, chemical, and mechanical) within the unit at the project site. All relevant characteristics of the biological processes would need to be identified.	Controlled

B10 Energy Consumption from Waste Processing	Energy may be required to power waste processing or handling equipment (i.e. compacters, etc.)	Controlled
Downstream During Baseline		
B11 Disposal of Equipment	The disposal of some materials/equipment which compose all or a component of the ECM or waste diversion systems may result in GHG emissions.	Related
B12 Development and Processing of Unit Material Outputs	The material outputs from the unit process need to be transported, developed, and/or processed subsequent to the unit process. This may require any number of mechanical, chemical or biological processes. All relevant characteristics of the material outputs would need to be identified to prove functional equivalence with the baseline scenario.	Related
B14 Waste Decomposition and Methane Release	Waste may decompose in the disposal facility (typically a landfill site) resulting in the production of methane. A methane collection and destruction system may be in place at the disposal site. If such a system is active in the landfill or the area of the landfill where this material is being disposed, then its characteristics must be identified and the efficiency (ie, percent of total methane generation that is capture and destroyed) must be accounted for in a reasonable manner. Disposal site characteristics and mass disposed of at each site may need to be identified.	Related
Downstream After Baseline		
B15 Decommission of Site	Once the facility is no longer operational, the site may need to be decommissioned. This may involve the disassembly of the equipment, demolition of on-site structures, disposal of some materials, environmental restoration, re-grading, planting or seeding, and transportation of materials off-site. Greenhouse gas emissions would be primarily attributed to the use of fossil fuels and electricity used to power equipment required to decommission the site.	Related

5.3 SS Selection

Each of the SS from the project and baseline scenario shall be compared and evaluated as to their relevancy. The justification for the potential exclusion or conditions upon which the SS may be excluded is provided in Table 3. Negligible emissions have been defined as being less than 1% of the project's lifetime emissions (calculated on an annual basis). Where the SS are to be excluded, they must fall below this threshold. Table 3 includes a generalized assessment that is expected to be accurate for most facilities. However, the project proponent must make an assessment for their specific project and may only exclude emissions that do not exceed the 1% threshold.

Table 3: Process for Selection of SS

Source		Gas	Included?	Justification/Explanation
Baseline	B1 Development and Processing of Unit Material Inputs	CO ₂	[Excluded]	Expected to be excluded as they must be functionally equivalent to allow for the application of the methodology.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B2 Building Equipment	CO ₂	[Excluded]	Expected to be excluded since emissions from manufacturing of building equipment are expected to be negligible over the lifetime of the project.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B4 Commissioning of Site	CO ₂	[Excluded]	Expected to be excluded since emissions from site development are expected to be negligible given the minimal site development typically required.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B5 Fuel Production & Delivery	CO ₂	[Excluded]	Expected to be excluded since emissions from fuel production and delivery are expected to be greater under the baseline scenario.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B6 Electricity Generation & Delivery	CO ₂	[Excluded]	Expected to be excluded since emissions from electricity generation and delivery are expected to be greater under the baseline scenario.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B7 Building/System Energy Consumption (without ECMs)	CO ₂	Included	Must be included as part of baseline if energy efficiency actions are included in the project activity since this SS is fundamental to quantifying the baseline for EE emission reductions under this methodology.
		CH ₄	Included	
		N ₂ O	Included	

Source		Gas	Included?	Justification/Explanation
	B8 Maintenance	CO ₂	Included	Must be included, though can be excluded if the baseline and project scenarios would involve immaterial difference in energy consumed for maintenance activities.
		CH ₄	Included	
		N ₂ O	Included	
	B9 Unit Operation: Biological/Chemical/Mechanical Processes	CO ₂	Included	Must be included, though can be excluded if prescribed to be functionally equivalent.
		CH ₄	Included	
		N ₂ O	Included	
	B10 Energy Consumption from Waste Processing	CO ₂	Included	Must be included, though can be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the energy consumed for waste processing at the Territory level.
		CH ₄	Included	
		N ₂ O	Included	
	B11 Disposal of Equipment	CO ₂	[Excluded]	Expected to be excluded since emissions from disposal of equipment are expected to be negligible.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B12 Development and Processing of Unit Material Outputs	CO ₂	[Excluded]	Expected to be excluded as they must be functionally equivalent to allow for the application of the methodology.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	B14 Waste Decomposition and Methane Release	CO ₂	Included	Must be included, though can be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the amount methane emitted
		CH ₄	Included	
		N ₂ O	Included	

Source		Gas	Included?	Justification/Explanation
				from decomposition.
	B15 Decommission of Site	CO ₂	[Excluded]	Expected to be excluded since emissions from equipment disposal are expected to be negligible.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
Project	P1 Development and Processing of Unit Material Inputs	CO ₂	[Excluded]	Expected to be excluded as they must be functionally equivalent to allow for the application of the methodology.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	P2 Building Equipment	CO ₂	[Excluded]	Expected to be excluded since emissions from the manufacture of building equipment are expected to be negligible over the lifetime of the project.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	P4 Commissioning of Site	CO ₂	[Excluded]	Expected to be excluded since emissions from site development are expected to be negligible given the minimal site development typically required.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	P5 Fuel Production & Delivery	CO ₂	[Excluded]	Expected to be excluded since emissions from fuel production and delivery are expected to be greater under the baseline scenario.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	P6 Electricity Generation & Delivery	CO ₂	[Excluded]	Expected to be excluded since emissions from fuel production and delivery are expected to be
		CH ₄	[Excluded]	

Source		Gas	Included?	Justification/Explanation
		N ₂ O	[Excluded]	greater under the baseline scenario.
	P7 Building/System Energy Consumption (with ECMs)	CO ₂	Included	Must be included as part of baseline if energy efficiency actions are included in the project activity.
		CH ₄	Included	
		N ₂ O	Included	
	P8 Maintenance	CO ₂	Included	Must be included, though can be excluded if the baseline and project scenario operations would involve immaterial difference in energy consumed for maintenance activities. If however maintenance activities included major overhauls that would not have been included in the baseline scenario, evidence must be provided by the project proponent to show the SS is below the negligible emissions threshold.
		CH ₄	Included	
		N ₂ O	Included	
	P9 Unit Operation: Biological/Chemical/Mechanical Processes	CO ₂	Included	Must be included, though can be excluded if prescribed to be functionally equivalent.
		CH ₄	Included	
		N ₂ O	Included	
	P10 Energy Consumption from Waste Processing	CO ₂	Included	Must be included, though can be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the energy consumed for waste processing.
		CH ₄	Included	
		N ₂ O	Included	
	P11 Disposal of Equipment	CO ₂	[Excluded]	Expected to be excluded since emissions from disposal of equipment are expected to be negligible
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	

Source		Gas	Included?	Justification/Explanation
	P12 Development and Processing of Unit Material Outputs	CO ₂	[Excluded]	Expected to be excluded as they must be functionally equivalent to allow for the application of the methodology.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	
	P14 Waste Decomposition and Methane Release	CO ₂	Included	Must be included, though can be excluded if the facility or group of facilities is not quantifying emission reductions associated with waste diversion activities and if the ECM activities would not affect the amount methane emitted from decomposition.
		CH ₄	Included	
		N ₂ O	Included	
	P16 Energy Consumed from Alternative Processing of Waste / Use	CO ₂	Included	Must be included, though can only be excluded if the facility or group of facilities is not quantifying emission reductions associated with alternative processing of waste / use in the project scenario at the Territory level.
		CH ₄	Included	
		N ₂ O	Included	
	P17 Process Emissions from Alternative Processing of Waste	CO ₂	Included	Must be included, though can be excluded if the facility or group of facilities is not quantifying emission reductions associated with the alternative processing of waste at the Territory level.
		CH ₄	Included	
		N ₂ O	Included	
	P18 Decommission of Site	CO ₂	[Excluded]	Expected to be excluded since emissions from decommissioning are not expected to differ highly between the baseline and project scenarios.
		CH ₄	[Excluded]	
		N ₂ O	[Excluded]	

6 PROCEDURE FOR DETERMINING THE BASELINE SCENARIO AND DEMONSTRATING ADDITIONALITY

Regardless of the specific project type being proposed, the project proponent must follow the step-wise approach specified in the *CDM Combined Tool to Identify the Baseline Scenario and Demonstrate Additionality* to identify the baseline scenario and demonstrate additionality. The tool shall be applied with baseline alternatives and project scenarios categorized by project units. The cost savings associated with energy efficiency shall be included in the investment analysis.

When selecting the baseline period for waste diversion and energy efficiency activities, the appropriateness of baseline period shall be analyzed for the two activities separately. While one baseline period for both may be deemed appropriate, it is also possible that different baseline periods and approaches are required for the different activities. As one example, the best unit of productivity for the waste diversion baseline period may be different from that for the energy efficiency baseline period depending on the selected unit of productivity and the quality of data available for each.

The baseline scenario shall be determined by analyzing, at minimum, the following potential alternatives:

- a. Each business owner proactively exceeds the current regulations and decreases their per unit energy consumption. Additionally, each business owner could also purchase new capital equipment prior to the natural turnover rate of their existing stock, for the purposes of energy efficiency savings, without installing the added monitoring equipment as required to quantify GHG emission reductions. This step is essentially the implementation of the energy efficiency project activity without carbon financing.
- b. Each business owner proactively puts into place a system to treat waste in a manner other than anaerobic decomposition in a landfill. This step is essentially the implementation of the waste diversion project activity without carbon financing.
- c. The government or industrial sector enforces minimum building codes, not only for new facilities but for the current stock of buildings. These codes could mandate certain levels of efficiency or waste handling that could achieve the anticipated results of this protocol without the use of VCUs.
- d. The continuation of the current situation (ie, no project activity or other alternatives undertaken). Comparable outputs of the project – constant energy intensity per production unit and anaerobic decomposition of waste in landfill – will continue. Currently, technologies/ practices that provide outputs/services of comparable qualities, properties and application areas as the proposed project activity, are not incentivized and are not introduced to the market for dispersed client facilities. These facilities do not have the economies of scale necessary to develop and operate the necessary monitoring systems to achieve affordable gains similar to the goals of this protocol.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

Quantification of the reductions, removals and reversals of relevant SS for each of the greenhouses gases must be completed by using the baseline and project emissions equations specified for energy efficiency and waste diversion activities.

If the project proponent chooses to exclude any of the sources from the SS selection (Table 3: Process for Selection of SS

), a detailed justification must be provided for each exclusion.

7.1 Baseline Emissions

Emissions _{Adjusted Baseline EE}	= the energy efficiency activities related baseline emissions plus any adjustments needed to adjust it to the conditions of the monitoring period
Emissions _{Adjusted Baseline EE}	= Emissions _{Adjusted Building/System Energy Consumption w/o ECM} + Emissions _{Adjusted Maintenance} + Emissions _{Adjusted Unit Operation}

Emissions_{Adjusted Building Energy Consumption w/o ECM} = Emissions under SS **B7** Adjusted Building/System Energy Consumption (w/o ECMs)

Emissions_{Adjusted Maintenance} = Emissions under SS **B8** Adjusted Maintenance

Emissions_{Adjusted Unit Operation} = Emissions under SS **B9** Adjusted Unit Operation: Biological/Chemical/Mechanical Processes

Emissions _{Adjusted Baseline WASTE}	= the waste related baseline emissions plus any adjustments needed to adjust it to the conditions of the monitoring period
Emissions _{Adjusted Baseline WASTE}	= Emissions _{Adjusted Energy Consumption from Waste Processing} + Emissions _{Adjusted Waste Decomposition and Methane Release}

Emissions_{Adjusted Energy Consumption from Waste Processing} = Emissions under SS **B10** Adjusted Energy Consumption from Waste Processing

Emissions_{Adjusted Waste Decomposition and Methane Release} = Emissions under SS **B14** Adjusted Waste Decomposition and Methane Release

7.2 Adjustments

The project proponent may conduct emission adjustments for measuring functional equivalence as well as unit of productivity. The baseline scenario identified for the projects using this methodology may require adjustments to ensure functional equivalence with the project.

In order for this comparison between the project scenario and baseline scenario to be meaningful, the project and the baseline must provide the same function and quality of products or services. This consistency in metrics and units of production provides an ability to quantify actual emissions reductions achieved in the project scenario.

Table 4 provides SS-specific equations for the baseline component of the comparison. Table 5 provides project SS emission adjustment quantification.

In some cases, the project scenario cannot have the same units as the baseline. An example of this would be where the project seeks to displace conventional natural gas with landfill gas. In this case, the common metric would be the energy content of each fuel, reported as energy content/liter of fuel⁴.

The project proponent is strongly encouraged to review IPMVP volumes for examples of how to make adjustments for functional equivalence and productivity.

The unit of productivity must be used by the project proponent as a basis for incorporating functional equivalence within the calculation methodology. Examples of units of productivity could be: energy requirements for residential buildings, per square foot of front of house commercial space, per kg/L/m²/m³ of output from manufacturing facilities, etc. The unit of productivity shall be defined to account for any non-production sensitive components. In all cases the project proponent must thoroughly justify their assessment of the appropriate unit of productivity.

The project proponent must also justify the selection of data used for deriving the unit of productivity.

Functional equivalence adjustments are usually performed when the energy savings are quantified. In many cases, the quantification and claims of GHG emission reductions shall occur on a yearly basis; therefore, these adjustments need to be performed according to that same schedule. Typical adjustment includes routine adjustments and non-routine adjustments as explained below:

Routine Adjustments of the Baseline

IPMVP provides the following guidance on performing routine adjustments: “For any energy governing factors expected to change routinely during the monitoring period such as weather... a variety of techniques can be used to perform the adjustments. Techniques may be as simple as a constant value (no adjustment) or as complex as a several multiple parameter non-linear equations, each correlating energy with one or more independent variables. Valid mathematical techniques must be used to derive

⁴ Ibid.

the adjustment method.” The quantification of routine baseline adjustments should reflect best practice set out in the latest IPMVP volume⁵.

Non-Routine Adjustments of the Baseline

IPMVP provides examples of non-routine adjustments. The quantification of non-routine baseline adjustments should reflect best practice set out in the latest IPMVP volume.

Table 4: Baseline SS Emission Adjustment Quantification

⁵ IPMVP contains examples of routine and non-routine adjustments.

SS	Units	Baseline SS Formula
B7 Building/System Energy Consumption (without ECMs)	kgCO2e	$\text{Emissions}_{\text{Building/System Energy Consumption w/o ECM}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{GridCO_2e}] + [Thermal Energy * EF_{Thermal EnergyCO_2e}]$
B8 Maintenance	kgCO2e	$\text{Emissions}_{\text{Maintenance}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{GridCO_2e}] + [Thermal Energy * EF_{Thermal EnergyCO_2e}]$
B9 Unit Operation: Biological / Chemical / Mechanical Processes	kgCO2e	$\text{Emissions}_{\text{Unit Operation}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{GridCO_2e}] + [Thermal Energy * EF_{Thermal EnergyCO_2e}]$
B10 Energy Consumption from Waste Processing	kgCO2e	$\text{Emissions}_{\text{Energy Consumption from Waste Processing}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{GridCO_2e}] + [Thermal Energy * EF_{Thermal EnergyCO_2e}]$
B13 Energy Consumption from Waste Processing	kgCO2e	$\text{Emissions}_{\text{Energy Consumption from Waste Processing}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{GridCO_2e}] + [Thermal Energy * EF_{Thermal EnergyCO_2e}]$

B14 Waste Decomposition and Methane Release	kgCO2e	Emissions Waste Decomposition and Methane Release $= 1000 * \phi * (1 - f) * GWP_{CH_4} * (1 - OX) * \left(\frac{16}{12}\right) * F * DOC_f * MCF$ $* \sum_{x=1}^y \sum_j W_{j,x} * DOC_j * e^{-k_j(y-x)} * (1 - e^{-k_j})$ Waste Decomposition and Methane Release = Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site during the period from the start of the project activity to the end of the year y Model correction factor to account for model uncertainties (0.9) Fraction of methane captured at the solid waste disposal sites (SWDS) and flared, combusted or used in another manner Global Warming Potential (GWP) of methane, valid for the relevant commitment period Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste) Fraction of methane in the SWDS gas (volume fraction) (0.5) Fraction of degradable organic carbon (DOC) that can decompose Methane correction factor Mass of Waste Material type j Sent to Landfill in the year x (tons) Fraction of degradable organic carbon (by weight) in the waste type j Decay rate for the waste type j Waste type category (index) Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are re-calculated (x = y) Year for which methane emissions are calculated
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7.3 Project Emissions

Emissions _{Project EE}	= sum of the energy efficiency related emissions under the project scenario
Emissions _{Project EE}	= Emissions _{Building/System Energy Consumption with ECM} + Emissions _{Maintenance} + Emissions _{Unit Operation}

Emissions_{Building Energy Consumption with ECM} = Emissions under SS **P7** Building/System Energy Consumption (with ECMs)

Emissions_{Maintenance} = Emissions under SS **P8** Maintenance

Emissions_{Unit Operation} = Emissions under SS **P9** Unit Operation: Biological/Chemical/Mechanical Processes

Emissions _{Project WASTE}	= sum of the waste related emissions under the project scenario
Emissions _{Project WASTE}	= Emissions _{Energy Consumption from Waste Processing} + Emissions _{Waste Decomposition and Methane Release} + Emissions _{Energy Consumed from Alternative Processing of Waste Use} + Emissions _{Process Emissions from Alternative Processing of Waste}

Emissions_{Energy Consumption from Waste Processing} = Emissions under SS **P10** Energy Consumption from Waste Processing

Emissions_{Waste Decomposition and Methane Release} = Emissions under SS **P14** Waste Decomposition and Methane Release

Emissions_{Energy Consumed from alternative processing of waste / use} = Emissions under SS **P16** Energy Consumed from alternative processing of waste / use

Emissions_{Process Emissions from Alternative Processing of Waste} = Emissions under SS **P17** Process Emissions from Alternative Processing of Waste

Table 5 provides SS-specific equations for comparisons of the project SS.

Table 5: Project SS Emission Adjustment Quantification

SS	Units	Project SS Formula
P7 Building/System Energy Consumption (with ECMs)	kgCO ₂ e	$\text{Emissions}_{\text{Building/System Energy Consumption with ECM}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})]$
P8 Maintenance	kgCO ₂ e	$\text{Emissions}_{\text{Maintenance}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{Grid CO_2e}] + [Thermal Energy * EF_{Thermal Energy CO_2e}]$
P9 Unit Operation: Biological / Chemical / Mechanical Processes	kgCO ₂ e	$\text{Emissions}_{\text{Unit Operation}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{Grid CO_2e}] + [Thermal Energy * EF_{Thermal Energy CO_2e}]$
P10 Energy Consumption from Waste Processing	kgCO ₂ e	$\text{Emissions}_{\text{Energy Consumption from Waste Processing}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (GWP_{N_2O} * Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{Grid CO_2e}] + [Thermal Energy * EF_{Thermal Energy CO_2e}]$
P14 Waste Decomposition and Methane Release	kgCO ₂ e	$\begin{aligned} &\text{Emissions}_{\text{Waste Decomposition and Methane Release}} \\ &= 1000 * \phi * (1 - f) * GWP_{CH_4} * (1 - OX) * \left(\frac{16}{12}\right) * F * DOC_f * MCF \\ &\quad * \sum_{x=1}^y \sum_j W_{j,x} * DOC_j * e^{-k_j(y-x)} * (1 - e^{-k_j}) \end{aligned}$
P16 Energy Consumed from alternative processing of waste / use	kgCO ₂ e	$\text{Emissions}_{\text{Energy Consumed from alternative processing of waste / use}} = \sum [(Vol. Fuel_i * EF_{Fuel_i CO_2}) ; (GWP_{CH_4} * Vol. Fuel_i * EF_{Fuel_i CH_4}) ; (Vol. Fuel_i * EF_{Fuel_i N_2O})] + [Electricity * EF_{Grid CO_2e}] + [Thermal Energy * EF_{Thermal Energy CO_2e}]$
P17 Process Emissions from Alternative Processing of Waste	kgCO ₂ e	$\text{Emissions}_{\text{Process Emissions from Alternative Processing of Waste}} = \sum [(Mass_{CO_2}) ; (Mass_{N_2O}) ; (Mass_{CH_4})]$

7.4 Leakage

The project proponent must assess the likelihood of leakage based on the specific project activities. If it cannot be shown that no plausible material leakage would occur based on the specific project activities, then this methodology shall not be applied.

The project proponent must quantify GHG emissions sources occurring outside the project boundary as a result of implementation of the project activities, which are expected to contribute more than 1% of the overall average emission reductions.

7.5 Summary of GHG Emission Reduction and/or Removals

Quantification of the net GHG reductions must be calculated using the equation set out below.

Emission Reductions	= [Emission _{Adjusted Baseline EE} – Emissions _{Project EE}]
+ [Emission _{Adjusted Baseline WASTE} – Emissions _{Project WASTE}]	
Where:	
Emissions _{Adjusted Baseline EE}	= the energy efficiency related baseline emissions plus any adjustments needed to adjust it to the conditions of the monitoring period
Emissions _{Adjusted Baseline WASTE}	= the waste related baseline emissions plus any adjustments needed to adjust it to the conditions of the monitoring period
Emissions _{Project EE}	= sum of the energy efficiency related emissions under the project scenario
Emissions _{Project WASTE}	= sum of the waste related emissions under the project scenario

8 Monitoring

8.1 Parameters Available at Validation

The following data units/parameters are referred to numerous times in the formulas presented in Section 6. Actual measured or local data are to be used when available. If not available, regional data must be used. The data sources for each parameter are offered below, however; in their absence, IPCC defaults can be used from the most recent version of the IPCC Guidelines for National Greenhouse Gas Inventories.

Parameter:	EF Thermal Energy _{CO₂e}
Data unit:	Kg CO ₂ e per GJ
Description:	CO ₂ e emissions factor for local generation of thermal energy
Source of data:	For the Territory of interest, the project proponent must identify the most appropriate CO ₂ e emission factor for the source of thermal energy used under the project scenario. Regional data (for example: US Department of Energy's Form EIA-1605 Appendix N. Emission factors for Steam and Chilled/Hot Water) shall be used. In its absence, IPCC defaults must be used from the most recent version of <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice.
Justification of choice of data or description of measurement methods and procedures applied:	Thermal Energy generation characteristics are likely to remain relatively stable over a year's time.

Parameter:	EF Fuel _{i N₂O}
Data unit:	Kg N ₂ O per L, m ³ , or other
Description:	N ₂ O emissions factor for combustion of each type of fuel (EF Fuel _{i N₂O})
Source of data:	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors for the source of thermal energy used under the project condition. Regional data (for example: EPA's AP 42, <i>Compilation of Air Pollutant Emission Factors</i>) shall be used. In its absence, IPCC defaults must be used from the most recent version of <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice.
Justification of choice of data or description of measurement methods and procedures applied:	This is one of the most comprehensive fuel emission factor databases available.

Parameter:	EF Fuel _{i CH4}
Data unit:	Kg CH ₄ per L, m ³ , or other
Description:	CH ₄ emissions factor for combustion of each type of fuel (EF Fuel _{i CH4})
Source of data:	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors for the source of thermal energy used under the project scenario. Regional data (for example: EPA's AP 42, <i>Compilation of Air Pollutant Emission Factors</i>) shall be used. In its absence, IPCC defaults can be used from the most recent version of <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice.
Justification of choice of data or description of measurement methods and procedures applied:	This is one of the most comprehensive fuel emission factor databases available.

Parameter:	EF Fuel _{i CO2}
Data unit:	Kg CO ₂ per L, m ³ , or other
Description:	CO ₂ Emissions Factor for combustion of each type of fuel (EF Fuel _{i CO2})
Source of data:	For both mobile and stationary fuel combustion for the Territory of interest, the project proponent must identify the most appropriate emission factors for the source of thermal energy used under the project scenario. Regional data (for example: EPA's AP 42, <i>Compilation of Air Pollutant Emission Factors</i>) shall be used. In its absence, IPCC defaults can be used from the most recent version of <i>IPCC Guidelines for National Greenhouse Gas Inventories</i> providing they are deemed to reasonably represent local circumstances. The project proponent must choose the values in a conservative manner and justify the choice.
Justification of choice of data or description of measurement methods and procedures applied:	This is one of the most comprehensive fuel emission factor databases available.

Parameter:	ϕ
Data unit:	-
Description:	Model correction factor to account for model uncertainties (0.9)
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Parameter:	OX
Data unit:	-
Description:	Oxidation factor (reflecting the amount of soil or other material covering the waste)
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Parameter:	DOC _f
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Parameter:	DOC _j
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight)
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Parameter:	MCF
Data unit:	-
Description:	Methane correction factor
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Parameter:	k_j																																						
Data unit:	-																																						
Description:	Decay rate for the waste type j																																						
Source of data:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)																																						
Justification of choice of data or description of measurement methods and procedures applied:	Apply the following default values for the different waste types j <table><tr><th colspan="2" rowspan="2">Waste type j</th><th colspan="2">Boreal and Temperate (MAT≤20°C)</th><th colspan="2">Tropical (MAT>20°C)</th></tr><tr><th>Dry (MAP/PET <1)</th><th>Wet (MAP/PET >1)</th><th>Dry (MAP< 1000mm)</th><th>Wet (MAP> 1000mm)</th></tr><tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper, cardboard (other than sludge), textiles</td><td>0.04</td><td>0.06</td><td>0.045</td><td>0.07</td></tr><tr><td>Wood, wood products and straw</td><td>0.02</td><td>0.03</td><td>0.025</td><td>0.035</td></tr><tr><td>Moderately degrading</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.05</td><td>0.10</td><td>0.065</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>0.06</td><td>0.185</td><td>0.085</td><td>0.40</td></tr></table> NB: MAT – mean annual temperature, MAP – Mean annual precipitation, PET – potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration. If a waste type, prevented from disposal by the proposed CDM project activity, cannot clearly be attributed to one of the waste types in the table above, project participants choose among the waste types that have similar characteristics that waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology. Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available. Provide references.						Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)	Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07	Wood, wood products and straw	0.02	0.03	0.025	0.035	Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17	Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.06	0.185	0.085	0.40
Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)																																			
		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)																																		
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07																																		
	Wood, wood products and straw	0.02	0.03	0.025	0.035																																		
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17																																		
Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.06	0.185	0.085	0.40																																		

8.2 Data and Parameters Monitored

The specific data and parameters associated with each SS are identified below.

Data Unit / Parameter:	Vol. Fuel _i
Data unit:	L, m ³ , or other
Description:	Volume of each type of fuel combusted. This volume of fuel is adjusted for both functional equivalence and units of productivity.
Source of data:	The volume of fuel is determined by third party custody invoices, consolidated monthly. Un-calibrated internal meters cannot be used.
Description of measurement methods and procedures to be applied:	Monthly invoices filed for verification.
Frequency of monitoring/recording:	Monthly.
QA/QC procedures to be applied:	Manual transcription is avoided where possible.

Data Unit / Parameter:	Electricity
Data unit:	kWh
Description:	The amount of electricity consumed from the grid.
Source of data:	The amount of electricity consumed from the grid is determined by third party custody invoices, consolidated monthly. If internal meters are required for the Isolation Parameter Measurement option, calibration records is provided as per the manufacturer's schedule.
Description of measurement methods and procedures to be applied:	Monthly.
Frequency of monitoring/recording:	Manual transcription is avoided where possible.
QA/QC procedures to be applied:	Cross reference when possible.

Data Unit / Parameter:	EF Grid _{CO2e}
Data unit:	Kg CO2e per kWh
Description:	CO ₂ e Emissions Factor for electricity from the grid.
Source of data:	For the Territory of interest, the project proponent must calculate the emission factor for the appropriate emission factor using the CDM's "Tool to calculate the emission factor for an electricity system (Version 2.2.1)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	Refer to the latest version of the CDM tool.

Data Unit / Parameter:	Thermal Energy
Data unit:	GJ
Description:	Thermal Energy consumed at the facility. This amount is adjusted for both functional equivalence and units of productivity.
Source of data:	Thermal energy crossing the boundary is measured with monthly invoices. If the thermal energy crosses the boundary without a custody caliber meter, only calibrated internal meters is relied upon. Calibration records must be made available during verification.
Description of measurement methods and procedures to be applied:	Continuous Metering or invoice reconciliation
Frequency of monitoring/recording:	Frequency of metering and reconciliation is most frequent as possible.
QA/QC procedures to be applied:	Cross-checked with the quantity of heat invoiced if relevant

Data Unit / Parameter:	$W_{j,x}$
Data unit:	kg
Description:	Mass of Waste Material Sent to Landfill
Source of data:	Direct measurement of mass of waste sent for disposal.
Description of measurement methods and procedures to be applied:	Continuous metering or invoice reconciliation. The mass of material diverted from conventional landfill disposal may be measured by invoice reconciliation from a sight appropriate for no anaerobic disposal of waste. The mass of organic material sent to landfill may be measured upon departure from the composting site or at the waste disposal site. Care must be taken to ensure no material is then diverted to landfill without being accounted for.
Frequency of monitoring/recording:	Both methods are standard practice. Frequency of metering is highest level possible.
QA/QC procedures to be applied:	As per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).

Data Unit / Parameter:	f
Data unit:	-
Description:	Fraction of methane captured in the SWDS gas
Source of data:	This factor is determined using the CDM's "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site (Version 05.1.0)" (CDM, 2011).
Justification of choice of data or description of measurement methods and procedures applied:	The most used tool for calculation landfill gas emission reductions.

Data Unit / Parameter:	Mass CO ₂
Data unit:	Kg
Description:	Mass of CO ₂ emitted as a process emissions
Source of data:	Measured or Estimated
Description of measurement methods and procedures to be applied:	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of CO ₂ . This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording:	Continuous measurement or hourly estimations
QA/QC procedures to be applied:	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.

Data Unit / Parameter:	MaSS N ₂ O
Data unit:	Kg
Description:	Mass of N ₂ O emitted as a process emissions
Source of data:	Measured or Estimated
Description of measurement methods and procedures to be applied:	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of N ₂ O. This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording:	Continuous measurement or hourly estimations
QA/QC procedures to be applied:	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.

Data Unit / Parameter:	Mass CH ₄
Data unit:	Kg
Description:	Mass of CH ₄ emitted as a process emissions
Source of data:	Measured or Estimated
Description of measurement methods and procedures to be applied:	This variable can be either measured or estimated. Measured process emissions would be conducted via a continuous monitoring system that records both the flow rate of the gas and the percent composition of CH ₄ . This would allow a mass to be accurately determined. If measurement is in place, calibration schedules and records must be provided in the project document. If estimation is used in absence of a continuous monitoring system, the details of the mass balance must be provided in the project document. The mass balance must include the justification around an average waste composition used in the mass balance.
Frequency of monitoring/recording:	Continuous measurement or hourly estimations
QA/QC procedures to be applied:	If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements or cross checking with other reported values.

8.3 Description of the Monitoring Plan

Data quality management must include sufficient data capture such that the mass and energy balances may be easily performed with the need for minimal assumptions and use of contingency procedures. The data shall be of sufficient quality to fulfill the quantification requirements and be substantiated by company records for the purpose of verification.

The project proponent shall establish and apply quality management procedures to manage data and information. Written procedures must be established for each measurement task outlining responsibility, timing and record location requirements. The greater the rigor of the management system for the data, the easier it will be to conduct an audit for the project.

In case of doubt regarding appropriateness of the proposed sample, the project proponent shall refer to the latest version of the CDM *General Guidelines for Sampling and Surveys for Small-Scale Project Activities and Programme of Activities (PoAs)*.

Record keeping practices shall include the following procedures:

- Electronic recording of values of logged primary parameters for each measurement interval;
- Offsite electronic back-up of all logged data;

- Written logs of operations and maintenance of the project system including notation of all shut-downs, start-ups and process adjustments; and
- Storage of all documents and records in a secure and retrievable manner for at least two years after the end of the project crediting period.

Quality assurance/Quality control (QA/QC) shall also be applied to add confidence that all measurements and calculations have been made correctly. These include, but are not limited to:

- Protecting monitoring equipment (sealed meters and data loggers);
- Protecting records of monitored data (hard copy and electronic storage);
- Checking data integrity on a regular and periodic basis (manual assessment, comparing redundant metered data, and detection of outstanding data/records);
- Comparing current estimates with previous estimates as a 'reality check';
- Provide sufficient training to operators to perform maintenance and calibration of monitoring devices;
- Establish minimum experience and requirements for operators in charge of project and monitoring; and
- Performing recalculations to make sure no mathematical errors have been made.

Requirements for sampling eligibility of a Territory within a Sustainable Community⁶:

- Project Units in the Territory, connected to the Sustainable Community and which apply all or part of the Sustainable Community activities (identified as ECM and/or waste diversion) are applicable for sampling as long the Sustainable Community data are collected and stored in the project proponent system.
- The project proponent's data collection and storage shall be centrally controlled and administered.
- The project proponent shall demonstrate its capacity to identify project units with data that inappropriately⁷ affects the confidence interval of the Sustainable Community; these project units shall either be audited or excluded from the Sustainable Community.

Confidence Interval requirements:

- The Confidence Interval shall be set to 95%.

⁶ Sampling requirements follow guidance provided in *ANSI/ASQC Z1.4-2008 "Sampling Procedures and Tables for Inspection" by Attributes* and *IAF MD 1:2007 "IAF Mandatory Document for the Certification of Multiple Sites Based on Sampling."*

⁷ Inappropriate in this context means data collected which, when compared to regional conditions, are outside the acceptable range (defect).

Sampling size requirements:

- The sample shall be partly selective based on factors, such as importance of activities and GHG reduction volume, range of activities being conducted, exceptional performance (beyond Territory and sectoral performance).
- The sample shall be partly nonselective, with at least 20% of the sample being selected at random.
- The project proponent shall have a documented procedure for determining the sample to be taken when verifying project sites and submit to the validation/verification body.
- When necessary, stratified random sampling shall be conducted on homogeneous sub-populations. The criteria for sub-population grouping are based on appropriate economic sectors. The criteria are based on an official territory authority classification or an internationally recognized equivalent (examples include the North American Industry Classification System (NAICS) or Statistical Classification of Economic Activities in the European Community (NACE⁸).

For a Territory, there are three different levels of sampling:

- Normal: the size of the sample shall be the square root of the number of project units connected to the project proponent, rounded to the upper whole number.
- Reduced: the size of the sample shall be the square root of the number of project units connected to the project proponent reduced by a coefficient (max. 0.6) when the overall confidence interval of the Sustainable Community data exceeds the target value⁹.
- Reinforced: the size of the sample shall be the square root of the number of project units connected to the project proponent increased by a coefficient (max. 1.3) when the overall confidence interval of the Sustainable Community data is below the target value.

Sample Defect requirements:

- The sample size shall be enlarged to a maximum of 160% of the initial size if the reported values for one or more GHG reduction activities is beyond the acceptable range (defect) and the number of defects exceeds the acceptable quality level.
- The sample size shall be reduced to a maximum of 60% of the initial size if all client facility reported values are within the acceptable range (no defects) for five consecutive samplings.

⁸ The Statistical Classification of Economic Activities in the European Community (in French: *Nomenclature Statistique des Activités économiques dans la Communauté Européenne (NACE)*) is a pan-European classification system which groups organizations according to their business activities.

⁹ The target value corresponds to a confidence interval of 95%.

REFERENCES AND OTHER INFORMATION

Acronyms

AENV	Alberta Environment
CCX	Chicago Climate Exchange
CDM	Clean Development Mechanism
CI	Confidence Interval
DOC	Degradable Organic Carbon
ECM	Energy Conservation Measure
EF	Emission Factor
EE	Energy Efficiency
EPA	Environmental Protection Agency
EVO	Efficiency Valuation Organization
f	Fraction
GHG	Greenhouse Gases
GJ	Gigajoule
GWP	Global Warming Potential
HVAC	Heating, Ventilation and Air Conditioning
ICI	Industrial, Commercial and Institutional Business Unit
IPCC	Intergovernmental Panel on Climate Change
IPMVP	International Performance Measurement and Verification Protocol
Kg	Kilograms
kWh	Kilowatt hour
/L	Per Litres
LFG	Landfill Gas
/m ²	Per square metre
/m ³	Per cubic metre
MAT	Mean Annual Temperature
M&V	Monitoring and Verification
MSW	Municipal Solid Waste
Mt	Metric tonnes
PET	Potential Evapotranspiration
QA/QC	Quality Assurance/ Quality Control
SC	Sustainable Community
SCSP	Sustainable Community Service Promoter
SS	Sources and Sinks

SWDS	Solid Waste Disposal Sites
UN	United Nations
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit