Component project activity design document form

(Version 09.0)

BASIC INFORMATION	
Title of the CPA	CPA-1: Landfill gas recovery, energy generation and biogas distribution from CTR Santa Rosa (Reference number 6573-0001)
Scale of the CPA	☒ Large-scale ☐ Small-scale
Version number of the CPA-DD	8.0
Completion date of the CPA-DD	10/08/2020
Title and UNFCCC reference number of the registered CDM PoA	Caixa Econômica Federal Solid Waste Management and Carbon Finance Project (UNFCCC reference number 6573)
Title and reference number of the corresponding generic CPA	Generic CPA-DD applicable for CPAs under design scenario 4.1 and 4.2
Coordinating/managing entity	Caixa Econômica Federal
Host Party	Brazil
Applied methodologies and standardized baselines	ACM0001 – Flaring or use of landfill gas (version 19.0)
Sectoral scopes	Sectoral scope 13 – Waste handling and disposal (mandatory) Sectoral scope 1 – Energy industries (renewable - / non-renewable sources) (conditional)
Estimated amount of annual average GHG emission reductions	1,147,291

SECTION A. Description of component project activity (CPA)

A.1. Purpose and general description of CPA

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Summarized description of CPA-1 Santa Rosa:

The registered CPA is designated "CPA-1: Landfill gas recovery, energy generation and biogas distribution from CTR Santa Rosa" (hereafter termed "CPA-1 Santa Rosa") and it is implemented as part of the PoA "Caixa Econômica Federal Solid Waste Management and Carbon Finance Project" (hereafter termed "Caixa's PoA").

Geographic Coordinates	*CTR Santa Rosa landfill*
Longitude (West)	43º45'38.01" W (-43.760558)
Latitude (South)	22º47'44.53"S (-22.795703)

Figure 1 – Location of the CPA

CPA-1 Santa Rosa promotes methane destruction as one of its GHG abatement/mitigation measures for which GHG emission reductions are accounted. Methane destruction occurs through collection and combustion of landfill gas (LFG) collected the CTR Santa Rosa landfill[1] through the application of the following technologies for combustion of LFG:

- Combustion of collected LFG under controlled and efficient conditions in a set of high temperature enclosed flares (in place since the occurred conclusion of the implementation of the CPA's LFG flaring infrastructure in year 2011 and its starting of operations).

- Combustion of collected LFG in a set of internal combustion gas engine-generator sets of which, as per the original CPA design configuration, were expected to be gradually implemented within the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa and within its 2nd 7-year crediting period[2].

[1] CTR stands for "*Centro de Tratamento de Resíduos"* in Portuguese language (contextually translated into English language as *"center for waste treatment/disposal").*

[2] As per the previously considered original CPA design configuration, the final total combined nameplate installed capacity for the CPA's electricity generation infrastructure is forecasted to be 25.47 MW. This final total combined nameplate installed capacity was at the time of the occurred CPA design conceptualization forecasted to be reached through the gradual/phased installation of 6 packages encompassing 3 engine-generator sets each package (with each engine-generator set having nameplate installed capacity of 1.415 MW) as follows:

- Period encompassing years 2013 and 2014: forecasted installation of 1 package of 3 engine-generator sets, representing an initial total combined installed capacity for the whole CPA's electricity generation infrastructure of 4.425 MW.
- Period encompassing years 2015 and 2016: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole CPA's generation infrastructure of 8.490 MW.
- Period encompassing years 2017 and 2018: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole CPA's electricity generation infrastructure of 12.735 MW.
- Period encompassing years 2019 and 2020: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole whole CPA's electricity generation infrastructure of of 16.980 MW.
- Period encompassing years 2021 and 2022: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole whole CPA's electricity generation infrastructure of of 21.225 MW.

- Combustion of collected LFG in methane destruction/utilization device(s) which is/are remotely located at consumer(s) facility(es) and to which upgraded LFG were to be supplied through natural gas distribution network serving the region where CPA-1 Santa Rosa is located[3].

As per the original CPA design configuration, CPA-1 Santa Rosa were to be gradually implemented under 3 phases:

- A first phase encompassing the installation of the LFG collection system and flare(s).
- A second encompassing the gradual installation of electricity generation infrastructure (initial phases).
- A third phase encompassing the implementation of required infrastructure to treat (upgrade) LFG in order to have a share of collected LFG being upgraded and distributed to consumer(s) through natural gas distribution network.

Also as per the original CPA design conceptualization, methane destruction is to occur as part of the operation of CPA-1 Santa Rosa as follows:

- The largest share of collected LFG were expected to be used as gaseous fuel for electricity generation
- A smaller share of collected LFG being upgraded and distributed to consumer(s) via a natural gas distribution network

- Period from year 2023 to year 2027: installation of 1 additional package of 3 engine-generator sets upon confirmation of availability of enough LFG in the CTR Santa Rosa landfill, representing forecasted final and total combined installed capacity for the whole CPA's electricity generation infrastructure of 25.470 MW.

It is crucial to note that in January/2020 (already within the 2nd 7-year crediting period of the CPA), the CPA's electricity generation infrastructure was finally implemented under a different design configuration and under significantly reduced total combined nameplate installed capacity of 4.245 MW (installation of 3 engine-generator sets engines with 1.415 MW) when compared to the CPA's original design configuration. Upon the successful renewal of the crediting period of CPA-1 Santa Rosa, a new version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa will be compiled for addressing this and other permanent design changes (which are valid for the 2nd crediting period). This yet to be completed new CPA-DD for the 2nd 7-year crediting period of CPA-1 Santa Rosa will then be opportunely assessed/validated by a Designated Operational Entity (DOE) as per applicable rules and procedures for addressing post-registration changes of CPAs.

The engine-generator sets of which installation were previously considered under the CPA's original design configuration are the state-of-the-art engine-generators set type 4, model/series G-420 manufactured in Austria by GE Jenbacher GmbH & Co OHG. This type/model of engine-generator set is the same as the 3 engine-generator sets implemented under the revised CPA design configurations and under operation since January/2020.

[3] As per the previously considered CPA original design configuration, the CPA's infrastructure for upgrading and supplying collected LFG to consumer (through natural gas distribution network) was previously forecasted to have LFG processing capacity of 5,000 Nm^3/h and with starting of its operations being previously forecasted to occur in year 2014.
Also as per the CPA original design conceptualization, upgrading of collected LFG for its utilization by consumer(s) would occur in a LFG upgrading infrastructure encompassing efficient removal of carbon dioxide (CO_2), nitrogen (N_2) and other components from collected LFG (in order to enrich its CH_4 content and meet applicable requirements in terms of contaminants for technically ensuring its utilization as gaseous fuel displacing fossil fuels (e.g. natural gas)). It is crucial to note that in January/2020 (already within the 2nd 7-year crediting period of the CPA), the CPA's infrastructure for upgrading and supplying collected LFG to consumer was finally implemented under a differentiated design configuration (with significantly higher total combined LFG processing capacity of up to 20,000 Nm^3/h). It is relevant to note that the previously considered supplying of upgraded LFG to consumer(s) through natural gas distribution network was also replaced by the supply by using trucks (road transportation). In order to make the supply of LFG to consumer(s) by using trucks, LFG has been further compressed in an appropriated LFG compression infrastructure (also implemented as part of CPA-1 Santa Rosa) prior of its transportation with LFG decompression occurring at the LFG delivery point(s).

Upon the successful renewal of the crediting period of CPA-1 Santa Rosa, a new version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa will be compiled for addressing this and other permanent design changes (which are valid for the 2nd crediting period). This yet to be completed new CPA-DD for the 2nd 7-year crediting period of CPA-1 Santa Rosa will then be opportunely assessed/validated by a Designated Operational Entity (DOE) as per applicable rules and procedures for addressing post-registration changes of CPAs.

- The remaining and lower share of collected LFG being flared in the CPA's high temperature enclosed flares[4].

As an additional GHG abatement/mitigation measure, CPA-1 Santa Rosa promotes electricity generation using LFG as gaseous fuel (thus promoting CO_2 emission reductions due to displacement of a more-GHG-intensive equivalent amount of electricity that would otherwise be generated by currently existing and future electricity generation sources (including fossil-fuel fired facilities) within the National Electricity Grid of Brazil).

It is relevant to note that as per the previously conceived original design configuration for CPA-1 Santa Rosa, displacement of natural gas and/or any other fossil fuel) due to the supply of upgraded LFG to consumer(s) (through natural gas distribution network) as part of the operation of the CPA is not regarded as GHG abatement/mitigation measure (and related potential GHG emission reductions are thus not claimable as part of CPA-1 Santa Rosa) [5].

[4] It is relevant to note that since no electricity generation infrastructure and no infrastructure for upgrading and supplying LFG to consumer(s) were ever implemented as part of CPA-1 Santa Rosa during its currently expired 1st 7-year crediting period, all collected LFG was destroyed through flaring as part of the operation of the CPA along its entire 1st 7-year crediting period. While all collected LFG was also destroyed through flaring as part of the operation of the CPA along a small fraction of its 2nd 7-year crediting (during the period from its starting on 15/10/2019 until January/2020), since January/2020 the largest share of collected LFG has been supplied to consumer(s) by using trucks, with other relevant share of collected LFG being combusted in a set of installed high temperature enclosed flares and with the lowest share being combusted in the currently installed engine-generator sets of the CPA's electricity generation infrastructure. The occurred changes in terms of the shares of collected LFG forecasted to be destroyed in flares and/or utilized along the 2nd 7-year crediting period of CPA-1 Santa Rosa will also be addressed in a yet to be completed new version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa that will address permanent design changes in the CPA design (which are valid for the 2nd crediting period).

[5] As per the CDM baseline and monitoring methodology to be applied for the 2nd 7-year crediting period of CPA-1 Santa Rosa and Caixa's PoA (ACM0001 (version 19.0)), it is generically assumed that in the absence of a CDM initiative promoting supply of LFG to consumer(s) (through natural gas network and/or by using trucks), the baseline scenario is directly assumed as being consumption of natural gas (under equivalent amount (on energy basis) and with related baseline emissions being determined as per applicable guidance of this CDM baseline and monitoring methodology.

Both the latest versions of the PoA-DD and CPA-DD valid for the currently expired 7-year crediting period of the Caixa's PoA and CPA-1 Santa Rosa respectively (PoA-DD version 7.1, dated 19/11/2013 and CPA-DD version 7.5, dated 11/09/2015) includes the following disclaimers confirming that displacement of natural gas by the supply of LFG to consumer(s) is not regarded as an additional GHG abatement/mitigation measure to be encompassed by CPA-1 Santa Rosa under its original design conceptualization:

> *"Since emission reductions are not intended to be claimed for displacing natural gas, AM0053 will not be used."*
>
> *(…)*
>
> *"For project activities that either flare the landfill gas, and/or generate electricity, and/or have a component where consumers will be supplied with gas through a natural gas distribution grid, given that for the latter case emissions reductions are not going to be claimed for displacing natural gas, baseline scenario assessment and description is performed according to approved baseline methodology ACM0001."*
>
> *(…)*
>
> *"No emissions reductions will be claimed for displacing natural gas."*

Although both the later approved and registered PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA (PoA-DD version 7.6, dated 24/11/2018) and its generic CPA-DD indeed include supply of upgraded LFG to consumer(s) (through natural gas distribution network and/or by using trucks) as GHG abatement/mitigation measure (for which related potential GHG emission reductions due to assumed displacement of natural gas are potentially claimable in line with related provisions of ACM0001 (version 19.0)), for the particular case of CPA-1 Santa Rosa, such additional GHG abatement/mitigation measure and associated potential emission reductions remain not being considered under its 2nd 7-year crediting period (as previously occurred within its currently expired 1st 7-year crediting period).

LFG (which is rich in methane (CH_4) has been generated at the CTR Santa Rosa landfill as a result of anaerobic decomposition of municipal solid waste (MSW) historically disposed in this solid waste disposal site (SWDS).

The CTR Santa Rosa landfill has been operated by the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental since its commissioning date and it is located in Rio de Janeiro state, in Seropédica municipality, close to Rio de Janeiro city, the second most populous Brazilian city.

The CTR Santa Rosa landfill covers an area of 1,699,512.97 m^2 and it started operations of disposal of MSW in March/2011. The landfill has received and renewed all necessary environmental licenses (permits) for operation. At the time of the initial design conceptualization of CPA-1 Santa Rosa, the CTR Santa Rosa landfill was expected to receive in its first year of operation about 6,000 tons of MSW per day from the municipalities of Rio de Janeiro, Seropédica and Itaguaí.

In summary, by promoting and allowing effective and efficient collection and combustion of LFG generated at the CTR Santa Rosa landfill, CPA-1 Santa Rosa thus promotes real and measureable greenhouse gas (GHG) emission reductions through destruction of methane (that would otherwise be directly emitted into the atmosphere in the absence of CPA-1 Santa Rosa (baseline scenario). Furthermore, the promotion of electricity generation using collected LFG as gaseous fuel also results on CO_2 emission reductions (due to displacement of a more-GHG-intensive equivalent amount of electricity that would otherwise be generated by currently existing and future electricity generation sources (including fossil-fuel fired facilities) within the National Electricity Grid of Brazil)).

As a summary, the CPA design (under its original design configuration) thus encompasses the following:

(i) Forced capturing/collection of LFG at the CTR Santa Rosa landfill
(ii) Methane destruction through combustion of collected LFG in high temperature enclosed flares (with minor share of collected LFG being directly to the flares)
(iii) Methane destruction through combustion of collected LFG in internal combustion gas engine-generator sets (with the largest share of collected LFG being utilized as gaseous fuel for electricity generation).
(iv) Methane destruction due to the operation of the CPA's infrastructure required for upgrading and supplying LFG to consumer(s) through natural gas distribution network.
(v) Monitoring of quantity and quality of (i) collected LFG which is sent for combustion in the high temperature enclosed flares, (ii) collected LFG which is used as sent for combustion in the internal combustion gas engine-generator sets of the CPA's electricity generation infrastructure and/or (iii) collected LFG which is sent for the CPA's infrastructure required for upgrading and supplying LFG to consumer(s) through natural gas distribution network.
(vi) Monitoring of conditions/status of occurrence of combustion/supply of LFG in/to each one of these methane destruction devices and LFG destinations in order to determine combustion efficiency in terms methane destruction (in the particular case of the CPA's flares) and monitoring the operational status/conditions of equipment that processes and/or consumes LFG as required by applied CDM baseline and monitoring methodologies (ACM0001 (version 19.0) and/or applicable methodological tools[6].

[6] Monitoring of the operational status/conditions of the internal combustion gas engine-generator sets of the CPA's electricity generation infrastructure may be made *inter-alia* through continuous monitoring of the operational status of such devices and/or monitoring the amount electricity generated on an individual or aggregated basis. Monitoring of the operational status/conditions of the CPA's infrastructure required for upgrading and supplying LFG to consumer(s) through natural gas distribution network may be performed *inter-alia* through continuous monitoring of the operational status of related infrastructure and/or monitoring the amount of upgraded LFG actually supplied to consumer(s) on an individual consumer or aggregated basis.

(vii) Monitoring of consumption of grid-sourced electricity by CPA-1 Santa Rosa.

Equipment and infrastructure installed and/or monitored as part of CPA-1 Santa Rosa (under its original design configuration) thus encompasses the following:

- a LFG collection network comprising a constantly growing number of vertical LFG collection wells (with eventual implementation of horizontal LFG collection trenches being also considered[7]);

- a LFG flaring station (currently comprising 4 high temperature enclosed flares[8] and all required monitoring and control systems);

- set of internal combustion gas engine-generators to be gradually implemented as part of the CPA's electricity generation infrastructure of which was a(t the time of the CPA initial design conceptualization) expected to reach final total combined nameplate installed capacity of 25.47 MW (capacity forecasted to be reached through the gradual/phased installation of 6 packages encompassing 3 engine-generator sets each with individual nameplate installed capacity of 1.415 MW).

- All infrastructure required for upgrading and supplying LFG to consumer(s) through natural gas distribution network (+ all required monitoring and control systems).

Summarized description of the baseline scenario under the 2nd 7-year crediting period (under the CPA's revised design configuration):

For the 2nd 7-year renewable crediting period of CPA-1 Santa Rosa, the baseline scenario for LFG management at the CTR Santa Rosa landfill (in terms of emissions of methane at the CTR Santa Rosa landfill) remains being the same as the scenario existing prior to the implementation of CPA-1 Santa Rosa:

- LFG generated at the CTR Santa Rosa landfill (with high content of methane) being freely directly emitted into the atmosphere (without any treatment, collection, continuous combustion or control through the surfaces of the landfill).

- Under the baseline scenario, it is still being assumed that in the absence of CPA-1 Santa Rosa no fraction of generated LFG would be combusted.

For the 2nd 7-year renewable crediting period of CPA-1 Santa Rosa, the baseline scenario for CO_2 emissions due to generation of electricity is equivalent amount of electricity being generated by more-GHG-intensive existing electricity generation sources (including fossil-fuel fired facilities) within the National Electricity Grid of Brazil and addition of new power generation sources.

[7] In August/2020 there was no horizontal LFG collection well/trench yet implemented as part of CPA-1 Santa Rosa.

[8] In August/2020 there were 4 high temperature enclosed flares installed and under operation as part of CPA-1 Santa Rosa. The number of operational high temperature enclosed flares may permanently or temporarily change during the remaining lifetime of the CPA. In case of occurrence of permanent change of the number of installed flares, this will be opportunely addressed as per applicable guidance for addressing post-registration changes in the CPA design. Specification details for the installed high temperature enclosed flares are included in Section A.3.

For the 2nd 7-year renewable crediting period of CPA-1 Santa Rosa, no baseline scenario and no baseline emissions are considered for consumption of natural gas since displacement of natural gas (and/or other fossil fuel(s)) by upgraded LFG supplied to consumer(s) is not regarded as a GHG abatement/mitigation measure encompassed by the CPA.

GHG emission reductions to be achieved by CPA-1 Santa Rosa:
By promoting permanent and real destruction of methane and generation of electricity by using renewable energy source as its GHG abatement/mitigation measures, CPA-1 Santa Rosa (under its original design configuration) is expected to promote total combined GHG emission reductions of 8,031,037 tCO_2e during its 2nd 7-year crediting period. This value is equivalent to average annual GHG emission reductions of 1,147,291 tCO_2e/year.

Environmental and climate change positive aspects of CPA-1 Santa Rosa (under its original design configuration):
While methane is a powerful greenhouse gas (GHG), the pre-project situation of emission of LFG into the atmosphere thus contributes to global warming. Collection and combustion of LFG promote real and permanent abatement of GHG emissions as a result of implementation and operation of CPA-1 Santa Rosa. Furthermore, generation of electricity, also as a result of implementation and operation of CPA-1 Santa Rosa (under its original design configuration), using LFG as renewable energy source also represents the promotion of real and permanent CO_2 emission reductions.

Besides climate change mitigation, CPA-1 Santa Rosa provides other important local environmental benefits: LFG contains trace amounts of volatile organic compounds, which are regarded as local air pollutants. Capturing of LFG using an active forced collection system and its combustion thus also promote reduction of emission of local pollutants. Furthermore, utilization of LFG as gaseous for electricity generation and supply of upgraded LFG to consumer(s) through natural gas distribution network represent initiatives that are not common in Brazil. CPA-1 Santa Rosa thus potentially represents demonstration initiatives for environmentally friendlier related technologies.

Other contribution of CPA-1 Santa Rosa towards Sustainable Development locally and in the whole country Brazil:

CPA-1 Santa Rosa also provides the following additional important local environmental and social benefits:

- Destruction of other air pollutants, such as hydrogen sulphide, that is present in trace quantities in LFG;
- Improved LFG management at the CTR Santa Rosa landfill promotes reduction of risks of occurrence of fire and explosion at the landfill as well as reduction of odor;
- Creation of local capacity building and local job opportunities
- Generation of electricity from renewable energy source, thus contributing towards to Brazil's efforts to increase the participation of renewable energy in the Brazilian energy generation profile, helping the country to achieve the goals outlined in its National Climate Change Plan.

Non-representing of CPA excluded from a previously registered PoA:
While included in the Caixa's PoA since 05/10/2012, CPA-1 Santa Rosa does not represent a Component Project Activity (CPA) that has been previously excluded from a previously registered CDM Programme of Activities (CDM-PoA) as a result of inter alia erroneous inclusion of CPAs.

A.2. Location of CPA

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CPA-1 Santa Rosa is implemented within the geographical limits of the CTR Santa Rosa landfill which is located in Rio de Janeiro state, between Seropédica and Itaguaí municipality on S/N, Estr. Santa Rosa - Piranema, Seropédica - RJ, 23890-000
The CPA geographical coordinates are summarized below:

- Latitude: 22º47'44.53"S (-22.795703)
- Longitude: 43º45'38.01" W (-43.760558)

A.3. Technologies/measures

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CPA-1 Santa Rosa involves the installation of a landfill gas collection and flaring/utilization/supply infrastructure at the CTR Santa Rosa landfill as follows:

The CPA-1 Santa Rosa encompasses the installation and operation of a LFG collection and flaring/ utilization/supply infrastructure in an existing landfill site.

By taking into account specific requirements applicable for PoAs from both the ACM0001 (version 19.0) and the CDM Project Standard for Programmes of Activities (CDM-PS-PoA) (version 02.0) as well as the baseline scenario for LFG management at the CTR Santa Rosa landfill; CPA-1 Santa Rosa represents CPA design scenario 4.2 of the Caixa's PoA as summarized in the table below[9]:

CPA design scenario	Destruction of methane emissions and/or displacement of a more-GHG-intensive service Capture of landfill gas (LFG) and its flaring and/or use to produce energy and/or use to supply consumers			
	Destruction of methane emission	**Displacement of a more-GHG-intensive service**	**Release of LFG from the SWDS under the baseline scenario**	**Combination of types of use for collected LFG under the project scenario (for the displacing of a more-GHG-intensive-service)**
4.2	Yes	Yes. Share of collected LFG is used as gaseous fuel for electricity generation and supplied to consumer(s)[10]	Total	Yes. Combination occurs

[9] As outlined in the latest version of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA, by taking into account specific requirements applicable for PoAs from both the ACM0001 (version 19.0) and the CDM project standard for programmes of activities (CDM-PS-PoA), each CPA to be encompassed by the Caixa's PoA will consist in one of 8 (eight) potentially identified CPA design scenarios (CPA design scenario 1.1, 1.2, 2.1, 2.2, 3.1, 3.2, 4.1 and 4.2). Such potential design scenarios were not defined at the time of the previously occurred inclusion of CPA-1 Santa Rosa in the Caixa's PoA.

[10] It is relevant to note that, as further justified in Section A.1, as per the previously conceived original design configuration for CPA-1 Santa Rosa, displacement of natural gas and/or any other fossil fuel) due to the supply of upgraded LFG to consumer(s) (through natural gas distribution network) as part of the operation of the CPA is not regarded as GHG abatement/mitigation measure (and related potential GHG emission reductions are thus not claimable as part of CPA-1 Santa Rosa). Anyway, despite of such assumption, CPA-1 Santa Rosa remains representing CPA design scenario 4.2 of the Caixa's PoA.

Details about CPA design scenario 4.2 and requirements for CPAs applying this particular design scenario are included in Section A.3 of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA. Confirmation that CPA-1 Santa Rosa has previously met applicable eligibility criteria for CPA inclusion is described in Section K.

Basic components of CPA-1 Santa Rosa

The components used under CPA-1 Santa Rosa fitting under CPA design scenario 4.2 for the Caixa's PoA is briefly described below.

CPA's LFG collection infrastructure:

- Set of LFG collection wells used to extract LFG.
- Optimized well spacing (for optimization of LFG collection rate whilst minimizing costs).
- Wellheads designed for appropriate LFG measurement and control.
- Condensate extraction from collected LFG and condensate storage systems designed at strategic low points throughout the LFG collection infrastructure.

CPA's LFG flaring infrastructure:

- Set of 4 high temperature enclosed flares with controlled combustion system.
- Centrifugal blowers system used to cause negative pressure in the LFG pipeline (before the blowers) and positive pressure (after the blowers) to direct LFG to the flare(s).
- Continuously monitoring of LFG flow[11], CH_4 content in the LFG sent to the flares, temperature of exhaust gas of the flares.
- In case project emissions from flaring are determined based on measurements (no utilization of applicable conservative default values), monitoring/determination of methane, oxygen, carbon dioxide and balance content/mass of exhaust gas of the flare(s). Furthermore, monitoring whether operational requirements for the flares (as defined by equipment manufacturer) are met as well as measuring fugitive methane emissions from the flares may also be performed.
- Security restart system, in case the system shuts down.

[11] LFG pressure and LFG temperature will also be monitored in case instrument(s) used to monitor the flow of LFG directed to the flare(s) (i.e. mass or volumetric flow meter(s)) does not automatically record and report measurements of LFG flow in normalized values.

Figure 1: View of the LFG flaring infrastructure of CPA-1 Santa Rosa

While ACM0001 (version 19.0) requires ex-post monitoring whether equipment combusting LFG operates under compliance with operational requirements and/or recommendations as set by equipment manufacturer, the main operational characteristics and specifications of high temperature enclosed flares[12] are defined as follows:

[12] The currently installed four high temperature enclosed flares are the only equipment combusting LFG installed as part of CPA-1 Santa Rosa of which compliance with operational specifications and maintenance requirements should be monitored as per ACM0001 (version 19.0) and the methodological tool "Project emissions from flaring" (version 03.0). Thus, specifications and characteristic of these equipment are thus reported in this Section. The specifications of other ancillary equipment for the project's LFG collection and destruction infrastructure (e.g. centrifugal blowers, valves, flow meters, gas analyzer, etc.) are not presented in this CPA-DD. However, specifications of all equipment and instrument are expected to be regularly reported in the Monitoring Reports to be issued along the 2nd 7-year crediting period of CPA-1 Santa Rosa. This is in accordance with applicable guidelines for completing the CPA-DD form and also in accordance with applicable methodological and monitoring requirements as set by ACM0001 (version 19.0) + applicable methodological tools as well as under conformance with the PoA-DD valid for the 2nd 7-year crediting period of Caixas's PoA.

LFG combustion flaring equipment	Characteristics/specifications
Flare 1	Manufacturer: Hofstetter B.V. Min. LFG flaring capacity (for continuous operation): 500 Nm^3/h Max. LFG flaring capacity (for continuous operation): 2,500 Nm^3/h Required min. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 500 ^oC Required max. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 1,200 ^oC Required frequency for inspection service (incl. inspection in the conditions of the flare's isolation ceramics revetment material): every 6 months Required replacement for the flare isolation ceramics revetment material: after 10 years of regular and appropriate operation.
Flare 2	Manufacturer: Hofstetter B.V. Min. LFG flaring capacity (for continuous operation): 1,000 Nm^3/h Max. LFG flaring capacity (for continuous operation): 5,000 Nm^3/h Required min. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 500 ^oC Required max. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 1,200 ^oC Required frequency for inspection service (incl. inspection in the conditions of the flare's isolation ceramics revetment material): every 6 months Required replacement for the flare isolation ceramics revetment material: after 10 years of regular and appropriate operation.
Flare 3 and Flare 4	Manufacturer: Biotecnogas s.r.l. Min. LFG flaring capacity (for continuous operation): 1,000 Nm^3/h Max. LFG flaring capacity (for continuous operation): 5,000 Nm^3/h Required min. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 500 ^oC Required max. temperature of the exhaust gas of the flare (to ensure LFG destruction under high CH_4 destruction efficiency): 1,200 ^oC Required frequency for inspection service (incl. inspection in the conditions of the flare's isolation ceramics revetment material): every 6 months Required replacement for the flare isolation ceramics revetment material: after 10 years of regular and appropriate operation.

CPA's electricity generation infrastructure:

As part of CPA-1 Santa Rosa (under its original design configuration), set of internal combustion gas engine-generators is to be gradually implemented as part of the CPA's electricity generation infrastructure. At the time of the CPA initial design conceptualization, the CPA's electricity generation infrastructure was expected to reach final total combined nameplate installed capacity of 25.47 MW capacity (installed capacity forecasted to be reached through the gradual/phased installation of 6 packages with each package encompassing 3 engine-generator sets with individual nameplate installed capacity of 1.415 MW).

The engine-generator sets considered to be gradually installed under the CPA original design configuration are the state-of-the-art engine-generators set type 4, model/series G-420 manufactured in Austria by GE Jenbacher GmbH & Co OHG and with individual nameplate power generation capacity of 1.415 MW each[13].

Figure 2: View of the type 4, G-420 series engine-generator set manufactured by GE Jenbacher GmbH & Co OHG

The GE Jenbacher lean-burn gas engines fuelled by LFG (such as the engine that is part of the type 4, G-420 series engine-generator set) have CH_4 destruction efficiency in the range of 99.5%. Such typical very high CH_4 destruction efficiency expected for set the internal combustion gas engines is in line with GHG calculation approach of ACM0001 (version 19.0) for the determination of baseline emissions for destruction of CH_4 in such methane destruction devices as presented in Section B.4.1.

[13] Depending on construction and assembly aspects of each individual engine-generator sets Jenbacher, type 4 model/series G-420 (e.g. selection of supplier of alternator and other electrical components), the nameplate installed capacity for assembled units (that includes the internal combustion gas engines) may be slightly higher or lower than 1.412 MW (1,412 kW). Nevertheless, it is crucial to note that under typical operational conditions, an individual set will never operate under working conditions able to reach exactly 100% of its nameplate power generator capacity (even when operated under full load and under favourable electricity grid conditions). In fact, under typical operational conditions (even under full load), power generation by each individual engine-generator set may be slightly below 1.412 MW.

Under the original design configuration for CPA-1 Santa Rosa, when fully implemented, the CPA's electricity generation infrastructure with gradual/phased implementation is to encompass a set of 18 identical internal engine-generator sets and will have final total combined nameplate installed capacity of 25.470 MW[14].

[14] As per the previously considered original CPA design configuration, the final total combined nameplate installed capacity for the CPA's electricity generation infrastructure is forecasted to be 25.47 MW. This final total combined nameplate installed capacity was at the time of the occurred CPA design conceptualization forecasted to be reached through the gradual/phased installation of 6 packages encompassing 3 engine-generator sets each package (with each engine-generator set having nameplate installed capacity of 1.415 MW) as follows:

- Period encompassing years 2013 and 2014: forecasted installation of 1 package of 3 engine-generator sets, representing an initial total combined installed capacity for the whole CPA's electricity generation infrastructure of 4.425 MW.
- Period encompassing years 2015 and 2016: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole CPA's generation infrastructure of 8.490 MW.
- Period encompassing years 2017 and 2018: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole CPA's electricity generation infrastructure of 12.735 MW.
- Period encompassing years 2019 and 2020: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole whole CPA's electricity generation infrastructure of of 16.980 MW.
- Period encompassing years 2021 and 2022: forecasted installation of 1 additional package of 3 engine-generator sets, representing total combined installed capacity for the whole whole CPA's electricity generation infrastructure of of 21.225 MW.
- Period from year 2023 to year 2027: installation of 1 additional package of 3 engine-generator sets upon confirmation of availability of enough LFG in the CTR Santa Rosa landfill, representing forecasted final and total combined installed capacity for the whole CPA's electricity generation infrastructure of 25.470 MW.

It is crucial to note that in January/2020 (already within the 2nd 7-year crediting period of the CPA), the CPA's electricity generation infrastructure was finally implemented under a different design configuration and under significantly reduced total combined nameplate installed capacity of 4.245 MW (installation of 3 engine-generator sets engines with 1.415 MW) when compared to the CPA's original design configuration. Upon the successful renewal of the crediting period of CPA-1 Santa Rosa, a new version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa will be compiled for addressing this and other permanent design changes (which are valid for the 2nd crediting period). This yet to be completed new CPA-DD for the 2nd 7-year crediting period of CPA-1 Santa Rosa will then be opportunely assessed/validated by a Designated Operational Entity (DOE) as per applicable rules and procedures for addressing post-registration changes of CPAs.

CPA's infrastructure for the upgrading and supplying of LFG to consumer(s) through natural gas distribution network

As part of CPA-1 Santa Rosa (under its original design configuration), upon required upgrading, share of collected LFG is to be supplied to consumer(s) through natural gas distribution network as a result of operation of the CPA's infrastructure for the promoting of LFG upgrade and its supply to consumer(s). In order to meet applicable related technical and commercial requirements for upgraded LFG, collected LFG suffers further treatment (upgrading) prior of being delivered to consumer(s) (e.g. removal of CO_2 and N_2 content present in collected LFG[15]).

Under the original design configuration for CPA-1 Santa Rosa, when fully implemented the CPA's infrastructure for upgrading and supplying collected LFG to consumer (through natural gas distribution network) is to have LFG processing capacity of 5,000 Nm^3/h[16].

Figure 3: View of an example of infrastructure to upgrade and supply LFG to consumer(s)

[15] Upgrading of collected LFG in a LFG upgrading infrastructure typically encompasses removal of CO_2, N_2 and other components from collected LFG in order to enrich its CH_4 content and meet applicable technical and commercial requirements for its utilization by consumers. It is crucial to note that the CPA's infrastructure for the upgrading and supplying of LFG to consumer(s) through natural gas distribution network was never implemented as per the above-summarized forecasted capacities and time plan.

[16] As per the previously considered CPA original design configuration, the CPA's infrastructure for upgrading and supplying collected LFG to consumer (through natural gas distribution network) was previously forecasted to have LFG processing capacity of 5,000 Nm^3/h and with starting of its operations being previously forecasted to occur in year 2014.
Also as per the CPA original design conceptualization, upgrading of collected LFG for its utilization by consumer(s) would occur in a LFG upgrading infrastructure encompassing efficient removal of carbon dioxide (CO_2), nitrogen (N_2) and other components from collected LFG (in order to enrich its CH_4 content and meet applicable requirements in terms of contaminants for technically ensuring its utilization as gaseous fuel displacing fossil fuels (e.g. natural gas)).
It is crucial to note that in January/2020 (already within the 2nd 7-year crediting period of the CPA), the CPA's infrastructure for upgrading and supplying collected LFG to consumer was finally implemented under a differentiated design configuration (with significantly higher total combined LFG processing capacity of up to 20,000 Nm^3/h). It is relevant to note that the previously considered supplying of upgraded LFG to consumer(s) through natural gas distribution network was also replaced by the supply by using trucks (road transportation). In order to make the supply of LFG to consumer(s) by using trucks, LFG has been further compressed in an appropriated LFG compression infrastructure (also implemented as part of CPA-1 Santa Rosa) prior of its transportation with LFG decompression occurring at the LFG delivery point(s).

Upon the successful renewal of the crediting period of CPA-1 Santa Rosa, a new version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa will be compiled for addressing this and other permanent design changes (which are valid for the 2nd crediting period). This yet to be completed new CPA-DD for the 2nd 7-year crediting period of CPA-1 Santa Rosa will then be opportunely assessed/validated by a Designated Operational Entity (DOE) as per applicable rules and procedures for addressing post-registration changes of CPAs.

Consumption of electricity by CPA-1 Santa Rosa

As per its original design conceptualization, all electricity demand for CPA-1 Santa Rosa is expected to be entirely met by consumption of grid-sourced electricity and/or by electricity to be sourced by the CPA's electricity generation infrastructure.
In summary, the electricity demand for CPA-1 Santa Rosa can technically be met by one of the following sources/approaches:

- Imports of grid-sourced electricity, or
- Electricity supply by the installed engine-generator sets fuelled by collected LFG

Consumption of fossil fuel by CPA-1 Santa Rosa (for purpose other than electricity generation and/or transportation of upgraded LFG)

As per the design of CPA-1 Santa Rosa, very low quantity of Liquified Petroleum Gas (LPG) is to be used as a start-up fuel to ignite the high temperature enclosed flares whenever it is required (e.g. after maintenance/repair events, after temporary interruptions in the supply of electricity to the CPA, etc.). LPG has been historically supplied to CPA-1 Santa Rosa in standard cylinders with 45 kg of net capacity of LPG by authorized LPG distributor. The mass or volume of consumed LPG by CPA-1 Santa Rosa is to be monitored[17].

CPA's delivery pipeline for upgraded LFG (connecting the CPA to local natural gas distribution network)
As per the CPA's original design configuration, delivery pipeline for upgraded LFG (connecting the CPA to local gas distribution network) will allow injection of upgraded LFG into natural gas distribution network, thus making the supply of upgraded LFG to consumer(s) technically possible.

CPA's monitoring system
As per the CPA's original design configuration, continuously monitoring or monitoring LFG flow[18], CH_4 content in the LFG sent to the CPA's LFG flaring infrastructure, CPA's electricity generation infrastructure and CPA's infrastructure for upgrading and supplying of LFG to consumer(s) through natural gas distribution network are to occur as part of the operation of the CPA.
The amount of electricity generated by the CPA's electricity generation infrastructure (and exported through the electricity grid the CPA is connected to) is also to be monitored. Consumption of grid-sourced electricity by the CPA-1 Santa Rosa is also to be monitored.

As per its original design conceptualization, CPA-1 Santa Rosa includes state-of-the-art monitoring equipment that is to be calibrated as per the applied approved monitoring methodology and/or as per recommendations of instrument/equipment manufactures.
All staff involved in the operation and monitoring of CPA-1 Santa Rosa are to be trained in order to have the CPA properly operated and monitored. Detailed description of the monitoring plan and monitoring instruments/equipment for CPA-1 Santa Rosa is included in section B.5.

[17] In accordance with the design of the four currently installed high temperature enclosed flares, Liquefied Petroleum Gas (LPG) has been used during short time periods for igniting the flares. For starting the flares, LPG is directed to the fuel injectors of the flare and once the flame is sufficiently stable, LFG is directed to the flares and supply of LPG to the injectors is thus ceased. By taking into account the type/purpose of use of LPG by CPA-1 Santa Rosa, it is deemed correct to assume that LPG does not represent any auxiliary fuel (which would be required to make the flammability of LFG sufficiently enough to be combusted in the project flares). It is important to note that during the short time LPG is being combusted during the flare ignition process, no measurements of LFG directed to flares are performed with the flare meeting the operational requirements (as set by equipment manufacturer (e.g. min. flow, min. temperature of exhaust gas of the flare, etc.)). Thus, whenever the minor quantity of LPG is being combusted in the flare, no emission reductions due to methane combustion are claimed. It is important to note that as outlined in Section B.4.1, all consumption of LPG by CPA-1 Santa Rosa to ignite the flares are to be accounted as project emissions

[18] LFG pressure and LFG temperature will also be monitored in case instrument(s) used to monitor the flow of LFG supplied to consumer(s) (i.e. mass or volumetric flow meter(s)) does not automatically record and report measurements of LFG flow in normalized values.

Monitoring data is to be recorded electronically will kept archived for two years after the end of the crediting period and will be regularly forwarded to the CME Caixa Econômica Federal. Besides of electronically archiving, monitoring data may be printed periodically (as an additional data backup measure).

Facilities, systems and equipment in the baseline scenario (absence of CPA-1 Santa Rosa)
The above mentioned systems and equipment which are part of CPA-1 Santa Rosa (under its original design configuration) are to be installed and operated in order to promote collection and utilization of LFG. Under the baseline scenario (absence of CPA-1 Santa Rosa), LFG generated at the CTR Santa Rosa landfill would be directly emitted into the atmosphere, with no destruction or utilization of LFG occurring. None of the CPA's devices promoting LFG destruction or utilization and none related monitoring systems would be installed under the baseline scenario (absence of CPA-1 Santa Rosa).

A.4. Coordinating/managing entity

>>
Caixa Econômica Federal

A.5. Parties and CPA implementers

Parties involved	CPA implementers	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Brazil (host)	Caixa Econômica Federal (Public entity) (CME)	No
	SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental (CPA implementer) (private entity)	Yes
Spain	International Bank for Reconstruction and Development acting as the Trustee of the Carbon Partnership Facility (Multilateral Fund)	No
	Kingdom of Spain – Ministry for the Ecological Transition & Ministry of Economy and Business (public entity)	No
Norway	Norwegian Ministry of Climate and Environment (public entity)	No
Sweden	Swedish Energy Agency (public entity)	No

A.6. Public funding of CPA

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There is no public funding from Annex I Parties of UNFCCC for the CPA-1 Santa Rosa.

A.7. History of CPA

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CPA-1 Santa Rosa was not previously registered as a CPA in another registered CDM PoA. CPA-1 Santa Rosa was not previously registered as CDM project activity that has been later deregistered either.

A.8. Debundling

>>
Not applicable

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines

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The following CDM baseline and monitoring methodology is applied for CPA-1 Santa Rosa:

- Consolidated baseline and monitoring methodology ACM0001 – version 19.0:
  "Flaring or use of landfill gas"
  (https://cdm.unfccc.int/methodologies/DB/Y88077XT5O83TZ2PYEZ36LFIAMAODR)

The following methodological tools are also applied for CPA-1 Santa Rosa:

- "Emissions from solid waste disposal sites" (version 08.0)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf)

- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf)

- "Project emissions from flaring" (version 03.0)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf)
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf)

- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 03)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf)

- "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0)
  (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf)

B.2. Project boundary, sources and greenhouse gases (GHGs)

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Under conformity with ACM0001 (version 19.0), the project boundary for CPA-1 Santa Rosa (under its original design configuration) is defined as the site where LFG is captured and destroyed/used, also including supply of upgraded LFG from the CPA's biogas treatment facility to consumer(s) through natural gas distribution network. Since the CPA's electricity demand will be met by both imports of grid-sourced electricity and/or by electricity generated by the CPA's electricity generation infrastructure, with excess of generated electricity being eventually exported through the electricity grid, the project boundary thus also includes the electricity grid to which CPA-1 Santa Rosa is connected to[19].

[19] Since the design of CPA-1 (under its original design configuration) encompasses utilization of collected LFG as gaseous fuel for electricity generation, the CPA's electricity demand is expected to be met by one of the following sources: 1) electricity generated by CPA-1 Santa Rosa / 2) imports of grid-sourced electricity

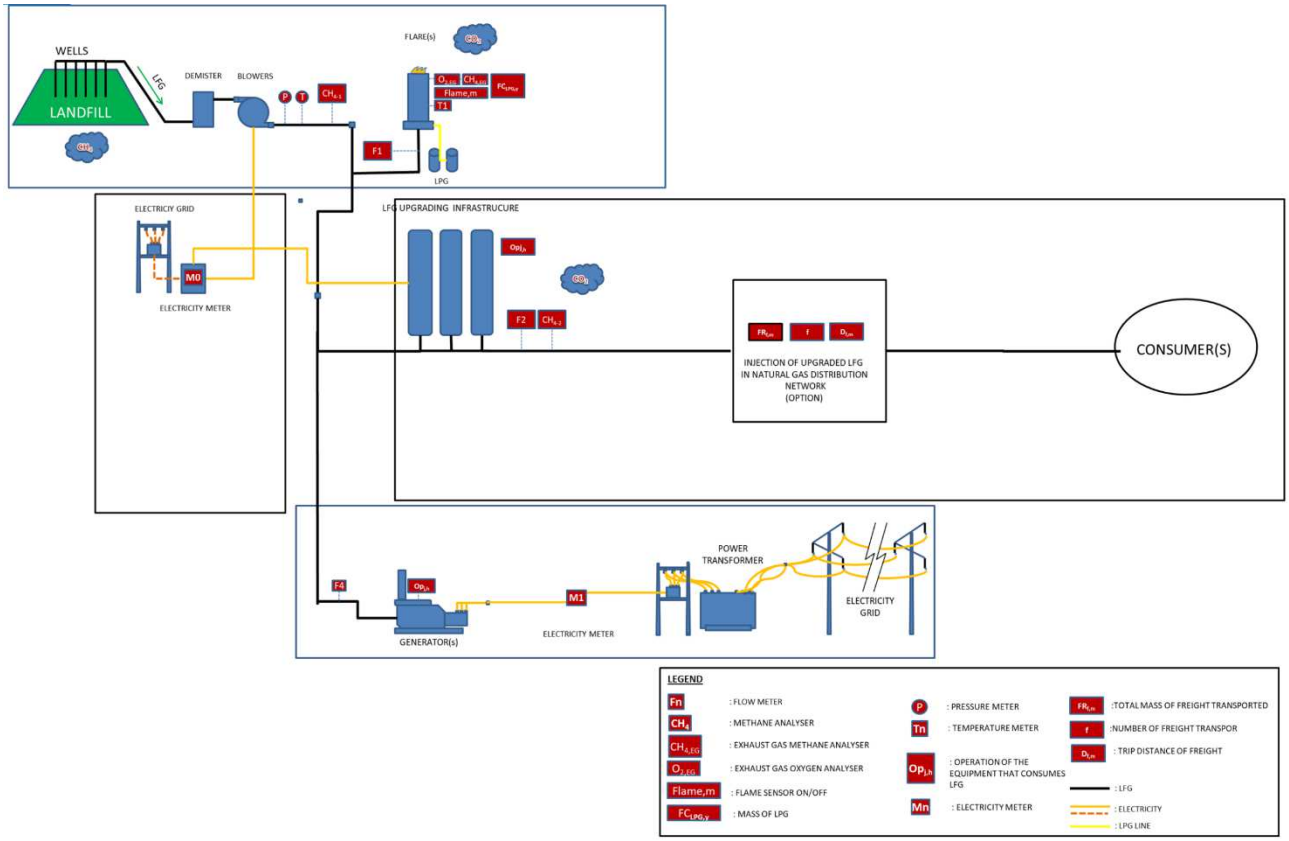
If applicable, the decision of meeting the project's electricity demand (under normal project operational circumstances) through option (1) or (2) may depend on commercial and/or technical aspects related to generation of electricity by CPA-1 Santa Rosa and/or eventual commercialization of excess generated electricity, transmission of excess electricity generated by the CPA and/or agreements with the local electricity distribution company.

Source		GHG	Included ?	Justification/Explanation
Baseline scenario	Emissions from decomposition of waste at the SWDS site.	CH_4	Yes	Major source of emissions in the baseline.
		N_2O	No	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative.
		CO_2	No	CO_2 emissions from decomposition of organic waste are not accounted since the CO2 is also released under the CPA
	Emissions from electricity generation	CO_2	Yes	Major emission source.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Emissions from the use of natural gas	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	No	Excluded[20].
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from flaring	CO_2	No	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Yes	May be an important emission source[21].
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
Project Secanrio	Emissions from fossil fuel consumption for purposes other than electricity generation or transportation due to the project activity	CO_2	Yes	Major emission source.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from electricity consumption due to the CPA	CO_2	Yes	Major emission source.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.

[20] As per the previously conceived original design configuration for CPA-1 Santa Rosa displacement of natural gas and/or any other fossil fuel) due to the supply of upgraded LFG to consumer(s) (through natural gas distribution network) as part of the operation of the CPA is not regarded as GHG abatement/mitigation measure (and related potential GHG emission reductions are thus not claimable as part of CPA-1 Santa Rosa)

[21] It is relevant to note that CH_4 emissions from flaring (under the project scenario) are addressed as part of the determination of baseline emissions for the CPA as established by ACM0001 (version 19.0).

The schematic flow diagram below summarizes the project boundary and delineates CPA-1 Santa Rosa (incl. equipment, parameters to be monitored and GHG included in the project boundary).



B.3. Establishment and description of baseline scenario

>>

This section includes the required application of the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1) for the required demonstration of the validity of the previously derived baseline scenario for CPA-1 Santa Rosa in the context of its renewal of 7-year crediting period. This is performed by presenting the whole determination of the baseline scenario for CPA-1 Santa Rosa by following applicable guidance and stepwise procedure of ACM0001 (version 19.0).

Application of the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period":

In the context of the renewal of the 7-year crediting period for CPA-1 Santa Rosa, as per applicable guidance of the CDM Project Cycle Procedure for Programme of Activities (CDM-PCP-PoA), the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1) is applied as follows[22]:

[22] The objective of applying this methodological tool is demonstrating the continuation of validity of the previously derived baseline scenario for the CPA-1 Santa Rosa (under its original design configuration) (which was previously determined and assessed at the time of the validation and inclusion of this CPA).

Step 1: Assess the validity of the current baseline for the next crediting period

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

As further explained in Section B.4.1, prior and at the time of the initial design conceptualization and inclusion of CPA-1 Santa Rosa, there was no legal obligation to capture and destroy or utilize LFG at the CTR Santa Rosa landfill and/or in any other existing landfill in Brazil. This situation currently is still prevailing[23].

[23] In August/2020, there was still no regional or national legal requirement in Brazil related to LFG collection and destruction and/or utilization in landfill sites using active or passive high temperature enclosed flares, engine-generator sets and/or any other type of methane combustion device and/or supply of LFG to consumer(s) through natural gas distribution network. Moreover, there was still no legal restriction neither requirement for passive venting of LFG or its sporadic combustion in conventional LFG destruction systems (e.g. passive flares and/or combustion drains). In summary, there is still no regional or national applicable regulation in the whole country of Brazil that deals with LFG management in landfill sites and/or generation of electricity using LFG as gaseous fuel and/or supply of LFG to consumer(s) through natural gas distribution network. Actually, there are still no applicable regulations that deals with LFG management in Brazil.

The Brazilian National Policy on Waste Management: After years of studies and negotiations, the Brazilian Regulation termed National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree) was finally published on 23/12/2010. In force since its publication and with no modifications/complementation since its issuance, this decree regulates the National Policy on Waste Management (PNRS) as established by Federal Law No. 12,305 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. This most recent Brazilian Regulation of the National Policy on Waste Management does not establish any requirement, obligation or recommendation related to LFG management at landfills in Brazil. The following is pointed out by the law firm "Tauil & Chequer Advogados" about the *Regulation of the National Policy on Waste Management* in an article published in year 2011 (of which content remains valid since no related regulatory change was made since year 2011):

> *"(...) The Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on December 23, 2010. In force since its publication, the Decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. The main purpose of the PNRS Interministerial Committee is to support the PNRS structuring and implementation, in order to enable the accomplishment of the provisions and goals set forth by the LPNRS. The Steering Committee has the basic function of guiding the implementation of reverse logistics. Among the instruments regulated by the Decree are the Reverse Logistics Systems, the Waste Management Plans (PGRS) and the National Registry for Hazardous Waste Operators. The Decree lists three specific instruments for the implementation and operation of the reverse logistic systems: (i) sectorial agreements, executed between public authorities and the industry; (ii) regulations, issued by the executive branch; and (iii) commitment agreements—which are to be adopted in the absence of sectorial agreements and regulations and when specific circumstances require more restrictive obligations—to be approved by the competent environmental agency. Regarding the obligation to prepare a PGRS, which should be required within environmental permitting proceedings, the Decree mentions the possibility of jointly submitting the PGRS under specific conditions and in cases where activities are conducted in the same condominium, municipality, micro-region or metropolitan/urban areas. Additionally, the Decree establishes that small companies that generate household waste, as provided for by article 30 of the LPNRS, are not required to submit a PGRS. Regarding the National Registry for Hazardous Waste Operators, which must be integrated to the already existing Federal Technical Registry of IBAMA, the Decree establishes a registration obligation for companies that manipulate or operate hazardous waste. The Decree also describes those who are considered generators or operators of hazardous waste, establishing several requirements for their authorization or permitting. These include the preparation of hazardous waste management plan, the demonstration of technical and economic capacity and the obtaining of civil liability insurance for environmental damages."* [SIC]

In line with the non-existence of any regional or national legal requirement in Brazil establishing LFG to be collected and destroyed/utilized in landfill sites at the time the design conceptualization and inclusion of CPA-1 Santa Rosa, no share of generated LFG was being voluntarily combusted in previously existent pre-project LFG venting/combustion drains located in the CTR Santa Rosa[24].

The demonstration of continuation of the baseline scenario for CPA-1 Santa Rosa is thus in full compliance with mandatory national, regional and/or sectorial policies and requirements.

Step 1.2: Assess the impact of circumstances

The previously identified baseline scenario for CPA-1 Santa Rosa is demonstrated as not changed at the time of requesting renewal of the crediting period[25].

While the baseline scenario for both methane emissions and electricity generation previously identified at the validation/inclusion stage of CPA-1 Santa Rosa was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is thus required for the renewal of the crediting period. This is required by the methodological tool *"*Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1).

As an outcome of such analysis, it is confirmed the following:

- The conditions and circumstances considered or taken into account to determine the baseline emissions of methane in the previous crediting period for CPA-1 Santa Rosa are still valid. LFG (rich in CH_4) generated at the CTR Santa Rosa landfill would still being freely emitted into the atmosphere (with no share of generated LFG being collected and destroyed in pre-project conventional passive LFG venting drains) in the absence of the CPA (baseline scenario). Generated LFG would still be freely emitted into the atmosphere through both the surface of the landfill. Furthermore, the conditions and circumstances considered or taken into account to determine the baseline emissions for electricity generation in the previous crediting period are still valid too[26].

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[24] The following related information is outlined in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa:

> *"For the case of the CTR Santa Rosa landfill site, which is located in the state of Rio de Janeiro, the environmental agency of the state does not require the landfill to install any landfill gas collection and flare system, including passive flaring. This is the common practice in the state of Rio de Janeiro. As a result the term AF is equal to zero, and hence $MD_{BL,y}$ is equal to zero."*

[25] Although the previously identified baseline scenario for CPA-1 Santa Rosa remains valid, it is important to note that the methodological approach for deriving baseline emissions and ex-ante estimations of emission reductions to be achieved by the CPA during its 2nd 7-year renewable crediting period is somehow different when compared to the one presented in the latest version of the CPA-DD (and related emission reduction spreadsheet) valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015).

While the version of ACM0001 baseline and monitoring methodology which was previously applied in the CPA-DD for the 1st crediting period of the CPA-1 Santa Rosa (ACM0001, version 11) includes a methodological approach for determining the baseline emissions which is based in specific set of methodological assumptions and approaches; the methodological assumptions (incl. default values) applicable as per ACM0001 (version 19.0) + applicable methodological tool are slightly different. Such differences indeed promote a relative slight decrease in estimations of ex-ante estimations of baseline emissions to be achieved by the CPA-1 Santa Rosa along its 2nd 7-year crediting period when compared to the 1st 7-year crediting period.

[26] It is relevant to note that, as per ACM0001 (version 19.0), for the supply of LFG to consumer(s) through natural gas distribution network, the baseline scenario is directly assumed to be the supply with natural gas. However, in the particular case of CPA-1 Santa Rosa, displacement of natural gas by upgraded LFG which is supplied to consumer(s) through natural gas distribution network is not considered/regarded as an additional GHG abatement/mitigation measure for the CPA. Thus, baseline scenario for the consumption of natural gas is not considered as part of the application of the stepwise approach of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period"

- There is no change in market or regulatory characteristics/aspects (incl. legal requirements) or new market or regulatory circumstances that would demand any type of re-assessment or re-evaluation for the determination of the baseline scenario for CPA-1 Santa Rosa under its 2nd 7-year renewable crediting period.

In line with the non-existence of any regional or national legal requirement in Brazil establishing LFG to be collected and destroyed/utilized in landfills and/or supplied to consumer(s) at the time CPA-1 Santa Rosa was validated/included, no share of generated LFG was being voluntarily combusted in previously existent pre-project LFG venting/combustion drains located in the CTR Santa Rosa landfill[27]. The demonstration of continuation of the baseline scenario for CPA-1 Santa Rosa (under its original design configuration) is thus in full compliance with mandatory national, regional and/or sectorial policies and requirements.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewable is requested.

While the baseline scenario previously identified at the validation/inclusion of CPA-1 Santa Rosa was not selected as "*the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology",* this step is thus not applicable.

The pre-project situation at the CTR Santa Rosa landfill does not include baseline equipment or investment.

Step 1.4: Assessment of the validity of the data and parameters

Some methodological requirements, ex-ante selected data and parameters (which were previously determined during the validation/inclusion of CPA-1 Santa Rosa as per the applicable requirements of the previously applied CDM baseline and monitoring methodology (ACM0001 (version 11)) will not any longer be valid/applicable during the 2nd 7-year crediting period of CPA-1 Santa Rosa.

As per the applied version of the valid CDM baseline and monitoring methodology (ACM0001 (version 19.0)) and related methodological tools, there are differentiated methodological approaches which are applicable and thus should be considered (incl. some of the ex-ante determined parameters, other default values and even other assumptions). Due to that, other data and ex-ante determined parameters are thus applied in the context of the demonstration of the validity of the previously derived baseline scenario and also applied in the determination of baseline emissions during the 2nd 7-year crediting period of CPA-1 Santa Rosa. Thus, some of data and parameters as presented in the latest version of the CPA-DD valid for the currently expired 1st crediting period of the CPA are not any longer valid.

As a conclusion, since (i) the demonstration of validity of the previously derived baseline scenario for CPA-1 Santa Rosa, (ii) determination of baseline emissions during the 2nd 7-year crediting period of the CPA and (iii) ex-ante determined parameters and default values are all determined/calculated as per applicable guidance of ACM0001 (version 19.0) and related methodological tools, the validity of previously defined ex-ante determined parameters is thus limited. The methodological approaches for the demonstration of validity of the previously derived baseline scenario + baseline emissions

[27] The following related information is outlined in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa:

"For this CPA, the state of Rio de Janeiro, does not have any regulation requiring landfills to have gas collection systems."

during the 2nd 7-year crediting period, ex-ante determined parameters and monitored parameters are presented and justified in this Section, in Section B.4.1, Section B.4.2 and Section B.5.1 respectively.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The determination of the baseline scenario for CPA-1 Santa Rosa (as per applicable guidance of ACM0001 (version 19.0)) is included below under "*Determination of the baseline scenario*".

It is important to note that while the baseline scenario for CPA-1 Santa Rosa was not changed for its 2nd 7-year renewable crediting period, the applied methodological approaches for the determination of baseline scenario and baseline emissions (as per ACM0001 (version 19.0)) is indeed slightly different than the one required by the previously applied version of the CDM baseline and monitoring methodology (ACM0001 (version 11)). Thus, for completeness reasons, this CPA-DD includes the whole determination of the baseline scenario and baseline emissions for CPA-1 Santa Rosa as per the applicable guidance and requirements and stepwise approaches of ACM0001 (version 19.0) regardless the fact baseline scenario remains being the same.

The determination of baseline emissions (by following all applicable guidance and requirements of ACM0001 (version 19.0) and applicable related methodological tools) is presented in Section B.4.1. Related ex-ante estimations of baseline emissions for the 2nd 7-year crediting period are summarized in Section B.4.3.

Step 2.2: Update the data and parameters

All applicable and required ex-ante determined parameters valid for the 2nd 7-year renewable crediting period of CPA-1 Santa Rosa are presented in Section B.4.2.

While some of the ex-ante determined parameters (which are summarized in Section B.4.2) are applied only in the context of ex-ante estimations of emission reductions along the 2nd crediting period, other ex-ante determined parameters will however be used for the calculation/determination of emission reductions in an ex-post basis (in conjunction with parameters determined ex-post) along the 2nd 7-year crediting period of the CPA.

It is also important to consider that ACM0001 (version 19.0) and applicable methodological tools include parameters (ex-ante or ex-post determined) which were not previously applied/considered in the CPA-DD valid for the 1st 7-year crediting period (as this particular CPA-DD was previously completed in accordance requirements and guidance of the baseline and monitoring methodology ACM0001 (version 11).

Furthermore, as also outlined in Section B.4.2 the value for the Global Warming Potential (GWP) for the GHG methane is also changed for the 2nd crediting period when compared to the value previously assumed during fraction of the 1st crediting period. The applied revised value for the ex-ante determined parameter GWP_{CH4} is in accordance with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol".

Determination of the baseline scenario (in order to demonstrate the continuation of previously identified baseline scenario) by following applicable stepwise procedure of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" as required by ACM0001 (version 19.0)):

According to ACM0001 (version 19.0), either i) the simplified procedures or ii) the procedures to select the most plausible baseline scenario and demonstrate additionality may be applied. In the case of CPA-1 Santa Rosa, option i is selected.

On the next steps, the continuation of the previously identified baseline scenario for CPA-1 Santa Rosa is confirmed through the application of the stepwise approach for determining baseline scenario as per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality"[28] (version 07.0) as required by ACM0001 (version 19.0) (applied as the applicable procedure to select the most plausible baseline scenario for CPA-1 Santa Rosa).

Application of the stepwise approach for determining baseline scenario as per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality":

STEP 0: Demonstration whether the proposed project activity is the *First-of-its-kind*

This optional step is not applied for the renewal of the crediting period of a previously included CPA.

STEP 1: Identification of alternative scenarios

SUB-STEP 1a: Define alternatives to CPA-1 Santa Rosa

Identification of alternatives for the destruction of LFG
In this step, the following baseline alternatives for LFG management at the CTR Santa Rosa landfill are taken into consideration:

LFG1: CPA-1 Santa Rosa being undertaken (implemented) without being registered as a CDM CPA (i.e. capture of landfill gas and its flaring and/or its use). This is a plausible alternative scenario, however involves significant investment and additional costs of landfill operations with no associated revenues (in the case of flaring of collected LFG as its unique measure).

LFG2: Atmospheric release of the landfill gas or capture of LFG in the CTR Santa Rosa landfill (a managed SWDS) and destruction through flaring only to comply with regulations or contractual requirements, and/or to address safety and odor concerns, and/or for other reasons. This scenario corresponds to the continuation of the pre-project situation (CPA-1 Santa Rosa or any other alternatives are not implemented).

LFG3: Atmospheric release of the landfill gas or partial capture of LFG in an unmanaged SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odor concerns, and/or for other reasons.

LFG4: LFG generation is partially avoided because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;

LFG5: LFG generation is partially avoided because part of the organic fraction of the solid

[28] This CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa does not include any reference and details for the previously assessed and demonstrated additionality of the CPA. This is in accordance with applicable CDM procedures and rules for renewal of 7-year crediting period of registered CPAs (since the additionality of the CPA is not required to be assessed as part of its renewal of 7-year crediting period).

waste is treated aerobically and not disposed in the SWDS;

LFG6: LFG generation is partially avoided because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.

CPA-1 Santa Rosa was previously implemented at a landfill site (well-managed SWDS) whose purpose is the final disposition of municipal solid waste (MSW) by adopting of landfilling practices and techniques. CPA-1 Santa Rosa has not previously promoted (and it is not expected to promote) any qualitative or quantitative change in MSW disposal and/or waste recycling and/or waste incineration related activities in the region of influence of the CTR Santa Rosa landfill. In this context, it is crucial to note that with or without CPA-1 Santa Rosa being implemented, no recycling and/or incineration of the organic fraction of waste to be disposed at the CTR Santa Rosa landfill would occur. The same applies to alternative treatments such as aerobic treatment, incineration of waste streams have at this particular landfill and/or in any other landfill, or recycling station located within the region of influence of the CTR Santa Rosa landfill. Furthermore, while the CTR Santa Rosa landfill is regarded as a well-managed SWDS, it is also crucial to note that with or without CPA-1 Santa Rosa being implemented, no MSW stream would be directed to an unmanaged SWDS.
Thus, alternative scenarios LFG3, LFG4, LFG5 and LFG6 are hereby automatically excluded in the context of the application of the stepwise approach for the identification of baseline alternatives. Such exclusions are under full conformance with applicable guidance of ACM0001 (version 19.0) as well as under conformance with applicable guidance defined by the PoA-DD for 2nd 7-year crediting period of the Caixa's PoA.

In fact, recycling of organic matter, aerobic treatment and incineration of MSW (under magnitude/scale comparable to the amount of MSW disposed at the CTR Santa Rosa landfill) has not been common practice in Brazil. The occurred implementation and operation of CPA-1 Santa Rosa has never promoted (and it is not expected to promote) any quantitative change (including reduction) in the amount of organic solid waste that could or would be eventually recycled. This is an applicability condition/criteria of ACM0001 (version 19.0). Furthermore, no change in MSW disposal (changing of MSW disposal site from the CTR Santa Rosa landfill to an unmanaged SWDS) is expected to occur.

Identification of alternatives for the utilization of LFG for electricity and/or heat generation:
The project design encompasses continuous utilization of LFG as gaseous fuel for electricity. In addition to the alternative baseline scenarios identified for the destruction of LFG, alternative scenarios for the use of LFG shall also be identified:
As per the original design configuration of CPA-1 Santa Rosa, LFG is utilized as fuel for electricity generation that is to be exported to the local electricity grid with a share of generated electricity eventually being eventually used to meet the project's electricity demand. Thus, realistic and credible alternatives for electricity generation in the absence of CPA-1 Santa Rosa (baseline scenario) are also determined.

For electricity generation, the realistic and credible alternative(s) may include:

E1: Electricity generation from LFG, undertaken without being registered as CDM project activity;

E2: Electricity generation in existing or new renewable or fossil fuel based captive power plant(s);

E3: Electricity generation in existing and/or new grid-connected power plants.

Scenario E2 is excluded. Since all electricity demand of the CTR Santa Rosa landfill has been historically met by a reliable supply of grid-sourced electricity (since the start of operations of the landfill), the utilization of a captive electricity generator to supply electricity for the landfill site (using renewable or fossil energy sources) never occurred and it is not foreseen to occur in the project scenario either.

Heat generation scenarios using LFG collected at the landfill as fuel are not part of CPA-1 Santa Rosa as there are no heat requirements at the CTR Santa Rosa landfill and CPA-1 Santa Rosa does not encompass use of collected LFG for heating or thermal purposes (i.e. use of collected LFG as gaseous fuel in boiler, air heater, glass melting furnace(s) and/or kiln). Therefore, scenarios H1 through H7, are not considered on the present analysis. This is in accordance with ACM0001 (version 19.0) and under conformance with guidelines and requirements from the PoA-DD of the 2nd 7-year crediting period of the Caixa's PoA.

Identification of alternative for the supply of LFG to natural gas distribution network and/or dedicated pipeline and/or distribution of compressed/liquefied LFG using trucks

CPA-1 Santa Rosa (under its original design configuration) encompasses the supply of upgraded LFG to consumer(s) through natural gas distribution network. However, it is relevant that as per the previously conceived original design configuration for CPA-1 Santa Rosa, displacement of natural gas and/or any other fossil fuel) due to the supply of upgraded LFG to consumer(s) (through natural gas distribution network) as part of the operation of the CPA is not regarded as GHG abatement/mitigation measure (and related potential GHG emission reductions are thus not claimable as part of CPA-1 Santa Rosa). Therefore, no alternative for the supply of LFG to natural gas distribution network is considered on the present analysis.

Outcome of SUB-STEP 1a: The only alternatives to be taken into consideration, after sub-step 1a) are LFG1, LFG2, E1 and E3.

SUB-STEP 1b: Consistency with mandatory applicable laws and regulations:

So far, there are still no legal restrictions or requirements for LFG collection and destruction in Brazil, neither for passive venting of LFG. Moreover there are still no legal restrictions or requirements for the utilization of LFG as gaseous fuel for electricity generation. Therefore, the remaining alternatives LFG1, LFG2, E1 and E3 are thus all under compliance with all applicable mandatory laws and regulations.

Outcome of SUB-STEP 1b: The only remaining alternatives to be taken into consideration after SUB-STEP 1b) are identified as LFG1, LFG2, E1 and E3.

STEP 2: Barrier analysis + STEP 3: Investment analysis + STEP 4: Common practice analysis

As per the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", STEP 2 (Barrier analysis) serves to identify barriers and to assess which alternative scenarios are prevented by these barriers.

The "Combined tool to identify the baseline scenario and demonstrate additionality" established the following regarding STEP 3 (Investment analysis):

> "*(…) The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The analysis should include all alternative scenarios remaining after Step 2, including scenarios where the project participants do not undertake an investment (S2 or S3)*."

Finally, the methodological tool outlines the following regarding STEP 4 (Common practice analysis):

> "*If the proposed project activity is the first-of-its-kind then this step is not applicable. Otherwise, the previous Steps shall be complemented with an analysis of the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and applicable geographical area. This test is a credibility check to demonstrate additionality and complements the barrier analysis (Step 2) and, where applicable, the investment analysis (Step 3).*"

As per the applicable methodological guidance of both ACM0001 (version 19.0) and the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0), determining baseline scenario for a LFG collection and destruction/utilization initiative proposed as a CPA of a PoA is somehow combined with assessing and demonstrating additionality for such proposed CPA.

While in the particular situation of the renewal of the 7-year crediting period of a previously registered/included CPA, it is not required to assess and demonstrate the validity of the previously assessed/demonstrated additionality (of which in the particular case of CPA-1 Santa Rosa was previously assessed and demonstrated (as outlined the latest version of the CPA-DD for its currently expired 1st 7-year crediting period (CPA-DD version 7.5, 11/09/2015)), the application of STEP 2, STEP 3 and STEP 4 of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) are thus automatically regarded as not applicable in the particular context of the demonstration of the continuation of the previously identified baseline scenario for the CPA along its 2nd 7-year crediting period (as a requirement for the renewal of its 7-year crediting period). This is in accordance with applicable guidance of the methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" and other applicable CDM guidelines and rules.

In summary, as part of the previously performed assessment and demonstration of additionality for CPA-1 Santa Rosa (as outlined the latest version of the CPA-DD for its currently expired 1st 7-year crediting period (CPA-DD version 7.5, 11/09/2015)), it was previously demonstrated that the alternative the CPA being undertaken without being registered under the CDM (hereby termed as alternative LFG1), alternative E1 (Electricity generation from LFG, undertaken without the CPA being registered under the CDM) do not represent baseline alternatives.
Thus, the only remaining baseline alternatives are alternative LFG2 (atmospheric release of the LFG or partial capture of LFG and destruction at the CTR Santa Rosa landfill (a well-managed SWDS) to comply with eventually existent regulations or requirements, or to address safety and odors concerns) + alternative E3 (Electricity generation in existing and/or new grid-connected power plants).

Procedure for estimating the end of the remaining lifetime of existing equipment

While remaining lifetime of existing equipment and prior consideration of CDM are also aspects that, if applicable, are required to be considered in the context of the determination of the baseline scenario, the following details are also relevant in the particular context of the demonstration of validity of the previously derived baseline scenario for CPA-1 Santa Rosa:

As per ACM0001 (version 19.0), this procedure is only applicable (in the context of the determination of baseline scenario for the CPA) if LFG has been ever utilized in existing equipment that was in operation prior to the implementation of CPA-1 Santa Rosa.

CPA-1 Santa Rosa was implemented and started operating in a landfill site of which start of MSW disposal operations is dated year 2011. No type of LFG destruction/utilization equipment was ever in place prior to the occurred implementation of CPA-1 Santa Rosa in

year 2012 (as there was no efficient LFG management involving combustion of LFG at all at the CTR Santa Rosa landfill prior of the implementation of the CPA and no efficient LFG management involving combustion of LFG would be implemented in the absence of the implemented CPA either).
This step of ACM0001 (version 19.0) is thus not required in the context of the demonstration of the continuation of the baseline scenario for CPA-1 Santa Rosa.

Conclusion about the demonstration of the continuation of validity of the previously identified baseline scenario):

As an outcome of the application of the applicable guidance of the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) and ACM0001 (version 19.0), it is demonstrated the continuation of previously identified baseline scenario.

The baseline scenario for methane emissions for CPA-1 Santa Rosa remains being identified as the atmospheric release of the LFG (with no share of generated LFG being partially collected and destroyed in pre-project venting/combustion drains).
The baseline scenario for electricity generation remains being eelectricity generation in existing and/or new power plants (connected to the electricity grid to which CPA-1 Santa Rosa is connected to).

Prior consideration of CDM
This step is not applicable for the renewal of the 7-year crediting period of CPA-1 Santa Rosa[29].

[29] As per currently valid applicable CDM rules, it is not required demonstrate prior consideration of the CDM for CPA-1 Santa Rosa in the context of the renewal of its 7-year crediting period. This step of ACM0001 (version 19.0) is thus not required in the context of the demonstration of the continuation of the baseline scenario for CPA-1 Santa Rosa.

B.4. Estimation of emission reductions

B.4.1. Explanation of methodological choices

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Emission reductions for CPA-1 Santa Rosa are ex-post determined along its 2nd 7-year crediting period as follows:

CPA-1 Santa Rosa applies the approved methodology ACM0001 (version 19.0) + applied methodological tools. In accordance with ACM0001 (version 19.0) + applied methodological tools and under conformance with applicable related requirements and guidance from the PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA (PoA of which CPA-1 Santa Rosa is part of), emission reductions to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period are determined (in tCO_2e) as the difference between baseline emissions (BE_Y) and project emissions (PE_Y) as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(0)}$$

Where:

BE_y	=	Baseline emissions in year *y* (in tCO_2e/yr)
PE_y	=	Project emissions in year *y* (in tCO_2e/yr)

Determination of Baseline Emissions (BE_y):

Baseline emissions are determined for CPA-1 Santa Rosa according to equation (1) and comprise the following emission sources:

a) Methane emissions from the SWDS in the absence of CPA-1 Santa Rosa;

b) CO_2 emissions for electricity generation using existent electricity generation sources (including fossil-fuel fired facilities) connected to National Electricity Grid of Brazil (SIN) and additions of new power generation sources in the absence of CPA-1 Santa Rosa (baseline scenario);

c) Emissions for heat generation using fossil fuels in the absence of CPA-1 Santa Rosa; and

d) Emissions for natural gas use from existing natural gas network in the absence of CPA-1 Santa Rosa.

$$BE_y = BE_{CH4,y} + BE_{EC,y} + BE_{HG,y} + BE_{NG,y} \quad \textbf{(1)}$$

Where:

BE_y	=	Baseline emissions in year *y* (in tCO_2e/yr)
$BE_{CH4,y}$	=	Baseline emissions of methane from the SWDS in year *y* (in tCO_2e/yr)
$BE_{EC,y}$	=	Baseline emissions associated with electricity generation in year *y* (in tCO_2e/yr)
$BE_{HG,y}$	=	Baseline emissions associated with heat generation in year *y* (in tCO_2e/yr)
$BE_{NG,y}$	=	Baseline emissions associated with natural gas use in year *y* (in tCO_2e/yr)

In the particular case of CPA-1 Santa Rosa (under its original design configuration), no collected LFG is currently expected to be used for heat generation purposes. Furthermore, as further explained in Section A.1, displacement of natural gas by upgraded LFG which is supplied to consumer(s) through natural gas distribution network is not considered/regarded as an additional GHG abatement/mitigation measure for the CPA. Thus, while $BE_{HG,y}$ is not applicable in the context of the determination of baseline emissions for the CPA during its 2nd 7-year crediting period either, $BE_{NG,y}$ is also regarded as null.
BE_y is determined as follows:

$BE_y = BE_{CH4,y} + BE_{ECy}$ **(1.1)**

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

Baseline emissions of methane from the anaerobic waste decomposition in the considered SWDS (CTR Santa Rosa landfill) ($BE_{CH4,y}$) are determined (in tCO_2e/yr) as per the formulas presented below. The determination of $BE_{CH4,y}$ is based on (i) the amount of methane that is actually captured and combusted as part of the operation of CPA-1 Santa Rosa (through combustion of collected LFG in high temperature enclosed flares and/or (ii) combustion of collected LFG in the engine-generator sets of the CPA's electricity generation component and/or (iii) by combustion of LFG by the consumer(s) to which upgraded LFG is supplied through natural gas distribution network and also (iv) by taking in account the amount of methane that would be captured and destroyed in the CTR Santa Rosa landfill in the absence of the CPA (baseline scenario).

In addition, the effect of methane oxidation (that is assumed as existing in the baseline and not in the project scenario) is also taken into account as also required by ACM0001 (version 19.0)[30].

$$BE_{CH4,y} = \left(\left(1 - OX_{top\_layer}\right) * F_{CH4,PJ,y} - F_{CH4,BL,y}\right) * GWP_{CH4} \quad \textbf{(2)}$$

Where:

OX_{top_layer}	=	Fraction of methane in the LFG that would be oxidized in the top layer of the SWDS in the baseline scenario (dimensionless)
$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used as part of the operation of CPA-1 Santa Rosa in year *y* (in tCH_4/yr)
$F_{CH4,BL,y}$	=	Amount of methane in the LFG that would be flared in the baseline (absence of CPA-1 Santa Rosa) in year *y* (in tCH_4/yr). $F_{CH4,BL,y}$ is determined under "*Determination of $F_{CH4,BL,y}$*".
GWP_{CH4}	=	Global warming potential of CH_4 (in tCO_2e/tCH_4)

Ex post determination of $F_{CH4,PJ,y}$

As per ACM0001 (version 19.0), the amount of methane in the LFG which is flared and/or utilized by CPA-1 Santa Rosa ($F_{CH4,PJ,y}$) is to be determined based on ex-post measurements (in tCH_4/yr) as the sum of quantity of methane flared and quantity of methane utilized/used in power plant(s) (electricity generation), boiler(s), air heater(s), glass melting furnace(s), kiln(s) and supplied to consumer(s) through natural gas distribution network and/or dedicated pipeline and/or using the

[30] As established by ACM0001 (version 19.0), the ex-ante determined parameter $OX_{top-layer}$ is the fraction of the methane that would be oxidized in the top layer of the considered SWDS in the absence of CPA-1 Santa Rosa (baseline scenario). As per ACM0001 (version 19.0), it is assumed that for a typical landfill site hosting a LFG collection and destruction and/or utilization CPA, this effect is reduced since part of the LFG which is captured does not pass through the top layer of the considered SWDS. This oxidation effect is also accounted for in the methodological tool "Emissions from solid waste disposal sites" (version 08.0). In addition to this effect, the installation of a LFG capture system as part of CPA-1 Santa Rosa may result in the suction of additional air into the considered SWDS. In some cases, such as CPA's and CDM project activities where the LFG collection is based on high suction pressure, the suction effort may decrease the amount of methane that is generated in the landfill under the project scenario. However, in most circumstances where the LFG is captured and used this effect was considered to be very small, as the operators of landfills have, in most cases, an incentive to main a high methane concentration in the LFG. For this reason, this effect is neglected as a conservative assumption.

trucks) as follows:

$$F_{CH4,\ PJ,\ y} = F_{CH4,flared\ \ ,y} + F_{CH4,\ EL,\ y} + F_{CH4,\ HG,\ y} + F_{CH4,\ NG,\ y} \quad \textbf{(3)}$$

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year *y* (in tCH_4)
$F_{CH4,EL,y}$	=	Amount of methane in the LFG which is used for electricity generation in year *y* (in tCH_4/yr)
$F_{CH4,HG,y}$	=	Amount of methane in the LFG which is used for heat generation in year *y* (in tCH_4/yr). While the project design currently does not encompass use of LFG as gaseous fuel for heat generation, $F_{CH4,HG,y}$ is thus assumed as null (zero).
$F_{CH4,NG,y}$	=	Amount of methane in the LFG which is supplied to consumer(s) through natural gas distribution network and/or dedicated pipeline and/or using the trucks in year *y* (in tCH_4/yr).

As also established by ACM0001 (version 19.0), for applicable cases, $F_{CH4,EL,y}$, $F_{CH4,HG,y}$ and $F_{CH4,NG,y}$ are determined by using the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0), and by also monitoring the working hours of the power plant(s), boiler(s), air heater(s), glass melting furnace(s) and kiln(s) and infrastructure for upgrading and supplying LFG to consumer(s) (if applicable), so that no emission reduction are claimed for methane destruction during non-working hours of the LFG utilization source in question. This is taken into account by monitoring the hours, *h*, that the equipment, *j*, utilizing the LFG is operating in year *y* ($Op_{j,h,y}$).

Thus, the amount of methane in the LFG which is flared and/or utilized by CPA-1 Santa Rosa will be determined as follows:

$$F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y} \quad \textbf{(4)}$$

In the particular case of CPA-1 Santa Rosa, like any CPA of the Caixa's PoA, since no collected LFG is expected to be used as gaseous fuel for heat generation purposes, $F_{CH4,HG,y}$ is not applicable in the context of the determination of $F_{CH4,PJ,y}$.

Determination of the amount of methane which is destroyed through combustion of collected LFG in the flares ($F_{CH4,flared,y}$)

$F_{CH4,flared,y}$ is determined as the difference between the amount of methane supplied to the flare(s) and any methane emissions from the flare(s), as follows:

$$F_{CH4,flared,y} = F_{CH4,sent\_flare,y} - \frac{PE_{flare,y}}{GWP_{CH4}} \quad \textbf{(5)}$$

Where:

$F_{CH4,flared,y}$	=	Amount of methane in the LFG which is destroyed by flaring in year *y* (in tCH_4/yr)
$F_{CH4,sent\_flare,y}$	=	Amount of methane in the LFG which is sent to the flare in year *y* (in tCH_4/yr)
$PE_{flare,y}$	=	Project emissions from flaring of the residual gas stream in year *y* (in tCO_2e/yr)
GWP_{CH4}	=	Global warming potential of CH_4 (in $tCO_2e/t\ CH_4$)

Determination of $F_{CH4,sent\_flare,y}$:

As per ACM0001 (version 19.0), for each individual installed high temperature enclosed flare installed as part of CPA-1 Santa Rosa, $F_{CH4,flared,y}$ is determined by following applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0).

The following requirements apply for the determination of $F_{CH4,flared,y}$ under an individual/specific CPA level for all CPA design scenarios:

- The gaseous stream that shall be considered in the application of the methodological tool is the stream of collected LFG which is sent to the flare(s);
- CH_4 is the greenhouse gas for which the mass flow is determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the methodological tool); and
- The mass flow should be calculated on an hourly basis for each hour *h* in year *y*;

Determination of the amount of amount of methane which is destroyed through combustion of collected LFG in the internal combustion gas engines of the CPA's electricity generation infrastructure ($F_{CH4,EL,y}$) and amount of methane in upgraded LFG which is supplied to consumer(s) through natural gas distribution network ($F_{CH4,NG,y}$):

$F_{CH4,EL,y}$ and $F_{CH4,NG,y}$ are determined directly using applicable guidance of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0), by applying the following requirements defined in ACM0001 (version 19.0):

- The gaseous stream the methodological tool shall be applied to is the stream of collected LFG which is sent to each engine-generator set of the CPA's electricity generation infrastructure and/or the stream of LFG which is sent to the infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network);
- CH_4 is the greenhouse gas for which the mass flow is determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 or 17 in the methodological tool); and
- The mass flow should be calculated on a an hourly basis for each hour *h* in year *y* and for each process *j*[31];
- The mass flow calculated for hour *h* is 0 if the engine-generator set(s) is/are not working in hour *h and/*or if no LFG is sent to the infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network) in hour *h* ($Op_{j,h}$ = equipment not working). The accumulated hourly values are then summed to a yearly unit basis. This is applicable for the particular case of CPA-1 Santa R0sa (under its original design conceptualization) for both elements/devices of the CPA's electricity generation infrastructure and CPA's infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network).

[31] It is relevant to note that in the particular case of CPA-1 Santa Rosa (under its original design configuration), at the same time instant, the flow of LFG being combusted in the CPA's flares, the flow of LFG used as gaseous fuel for electricity generation in the CPA's electricity generation infrastructure and the flow of LFG being sent to the CPA's infrastructure for the supply of upgraded LFG to consumer(s) may have different compositions (e.g. content/fraction of CH_4) due to design and operational aspects of CPA-1 Santa Rosa. Due to that, mass flow will be determined independently for each one of such LFG destruction/utilization processes on each time instant *t*.

Applicable guidance of the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" will be applied to determine $F_{CH4,sent\_flare,y}$, $F_{CH4,EL,y}$ and $F_{CH4,NG,y}$ by using the options A, B, C or D.

The selection of the determination option will depend on project conditions and equipment to be installed.

Use of Option A, B, C or D:
Depending on the construction and operational conditions of CPA-1 Santa Rosa, one of the following measurement options will be chosen and the following formulas applied for the determination of as $F_{i,t}$ [32]:

Option	Flow of gaseous stream	Volumetric fraction
A	Volume flow dry basis	Dry or wet basis[33]
B	Volume flow wet basis	Dry basis
C	Volume flow wet basis	Wet basis
D	Mass flow dry basis	Dry or wet basis

Option A:

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

- Measure the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) and demonstrate that this is less or equal to 0.05 kg H_2O/m^3 dry gas; or

- Demonstrate that the temperature of the gaseous stream ($T_{t,j}$) is less than 60ºC (333.15 K) at the flow measurement point.

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the corresponding option from the table above should be applied instead.

[32] The selection of option A, B, C or D will be done on an ex-post basis.

[33] While flow measurement on a dry basis may not be feasible at reasonable costs for a wet gaseous stream, so there will be no difference in the readings for volumetric fraction in wet basis analysers and dry basis analysers and both types can be used indistinctly for calculation Options A and D.

The mass flow of greenhouse gas CH_4 for time interval *t* and for process *j* ($F_{CH4,t,j}$) is determined as follows:

$$F_{CH4,t,j} = V_{t,db,j} * v_{CH4,t,db,j} * \rho_{CH4,t,j} \quad \textbf{(6)}$$

with

$$\rho_{CH4,t,j} = P_{t.j} * MM_{CH4} / R_u * T_{t.j} \quad \textbf{(7)}$$

Where:

$F_{CH4,t,j}$ = Mass flow of greenhouse gas CH_4 in the gaseous stream in time interval *t* for process *j* (in kg gas/h)

$V_{t,db,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis at normal conditions for process *j* (in m^3 dry gas/h)

$v_{CH4,t,db,j}$ = Volumetric fraction of CH_4 in the gaseous stream in time interval *t* on a dry basis for process *j* (in m^3 gas *i*/m^3 dry gas)

$\rho_{CH4,t,j}$ = Density of greenhouse gas CH_4 in the gaseous stream for time interval t for process *j* (in kg gas CH_4/m^3 gas CH_4)

$P_{t,j}$ = Absolute pressure of the gaseous stream in time interval *t* for process *j* (in Pa)
(where *j* is the LFG delivery pipeline to the flare(s), and/or the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure, and/or LFG delivery pipeline for the infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))

MM_i = Molecular mass of greenhouse gas *i* (in kg/kmol)

R_u = Universal ideal gases constant (in $Pa.m^3/kmol.K$)

$T_{t,j}$ = Temperature of the gaseous stream in time interval *t* for process *j* (in K).

Option B:

The mass flow of CH_4 for time interval *t* and for process *j* ($F_{CH4,t,j}$) is determined using equations (7) and (8). The volumetric flow of the gaseous stream in time interval *t* on a dry basis for process *j* ($V_{t,db,j}$) is determined by converting the measured volumetric flow from wet basis to dry basis as follows:

$$V_{t,db,j} = V_{t,wb,j} / (1 + v_{H2O,t,db,j}) \quad \textbf{(8)}$$

Where:

$V_{t,db,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis for process *j* (in m^3 dry gas/h)

$V_{t,wb,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a wet basis for process *j* (in m^3 wet gas/h)

$v_{H2O,t,db,j}$ = Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis for process *j* (in m^3 H_2O/m^3 dry gas).

The volumetric fraction of H_2O in time interval *t* on a dry basis ($v_{H2O,t,db}$) is estimated according to the following equation:

$v_{H2O,t,db,j} = (m_{H2O,t,db,j} * MM_{t,db,j}) / (MM_{H2O})$ **(9)**

Where:

$v_{H2O,t,db,j}$ = Volumetric fraction of H_2O in the gaseous stream in time interval *t* on a dry basis for process *j* (in m^3 H_2O/m^3 dry gas)

$m_{H2O,t,db,j}$ = Absolute humidity in the gaseous stream in time interval *t* on a dry basis for process *j* (in kg H_2O/kg dry gas)

$MM_{t,db,j}$ = Molecular mass of the gaseous stream in time interval *t* on a dry basis for process *j* (kg dry gas/kmol dry gas)

MM_{H2O} = Molecular mass of H_2O (in kg H_2O/kmol H_2O)

In case this Option is selected, the absolute humidity of the gaseous stream ($m_{H2O,t,db}$) will be determined using Option 2 specified below under "*Determination of the absolute humidity of the gaseous stream"* and the molecular mass of the gaseous stream ($MM_{t,db}$) will be determined using the following equation:

$$MM_{t,db} = \sum_k (v_{k,t,db} * MM_k) \quad \textbf{(10)}$$

Where:

$v_{k,t,db}$ = Volumetric fraction of gas *k* in the gaseous stream in time interval *t* on a dry basis (in m^3 gas k/m^3 dry gas) MM_k = Molecular mass of gas *k* (kg/kmol)

k = All gases, except H_2O contained in the gaseous stream (e.g. N_2, CO_2, O_2, CO, H_2, CH_4, N_2O, NO, NO_2, SO_2, SF_6 and PFCs). See simplification below. The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (*k*) in the gaseous stream. However, as a simplification, the volumetric fraction of only the gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. The simplification is not acceptable if it is differently specified in the underlying methodology.

Option C:

The mass flow of greenhouse gas *i* ($F_{i,t}$) is determined as follows:

$F_{CH4,t,j} = V_{t,wb,n,j} * v_{CH4,t,wb,j} * \rho_{CH4,n}$ **(11)**

with

$\rho_{CH4,n,j} = P_n * MM_{CH4} / R_u * T_n$ **(12)**

Where:

$F_{CH4,t,j}$ = Mass flow of CH_4 in the gaseous stream in time interval *t* for process *j* (in kg gas/h)

$V_{t,wb,n,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a wet

basis at normal conditions for process *j* (in m³ wet gas/h)

$v_{i,t,wb}$ = Volumetric fraction of CH_4 in the gaseous stream in time interval *t* on a wet basis for process *j* (in m³ gas *i*/m³ wet gas)

$\rho_{i,n}$ = Density of CH_4 in the gaseous stream at normal conditions (in kg gas *i*/m³ wet gas *i*)

P_n = Absolute pressure at normal conditions (in Pa)

T_n = Temperature at normal conditions (in K)

MM_{CH4} = Molecular mass of CH_4 (in kg/kmol)

R_u = Universal ideal gases constant (in Pa.m³/kmol.K)

The following equation should be used to convert the volumetric flow of the gaseous stream from actual conditions to normal conditions of temperature and pressure:

$$V_{t,wb,n,j} = V_{t,wb,j} * (T_n / T_{t,j}) * (P_{t,j} / P_n) \quad \textbf{(13)}$$

Where:

$V_{t,wb,n,j}$ = Volumetric flow of the gaseous stream in a time interval *t* on a wet basis at normal conditions for process *j* (in m³ wet gas/h)

$V_{t,wb,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a wet basis for process *j* (in m³ wet gas/h)

$P_{t,j}$ = Pressure of the gaseous stream in time interval *t* for process *j* (in Pa)

$T_{t,j}$ = Temperature of the gaseous stream in time interval *t* for process *j* (in K)

P_n = Absolute pressure at normal conditions (in Pa)

T_n = Temperature at normal conditions (in K)

Option D:

Flow measurement on a dry basis is not doable for a wet gaseous stream. Therefore, it is necessary to demonstrate that the gaseous stream is dry to use this option. There are two ways to do this:

- Measure the moisture content of the gaseous stream ($C_{H2O,t,db,n}$) and demonstrate that this is less or equal to 0.05 kg H_2O/m³ dry gas; or
- Demonstrate that the temperature of the gaseous stream ($T_{t,j}$) is less than 60ºC (333.15 K) at the flow measurement point.

If it cannot be demonstrated that the gaseous stream is dry, then the flow measurement should be assumed to be on a wet basis and the corresponding option from the above table should be applied instead.

The mass flow of greenhouse gas *i* ($F_{i,t}$) is determined using equations (6), (7) and (8). The volumetric flow of the gaseous stream in time interval *t* on a dry basis ($V_{t,db}$)

is determined by converting the mass flow of the gaseous stream to a volumetric flow as follows:

$$V_{t,db,j} = M_{t,db,j} / \rho_{t,db,j} \quad \textbf{(14)}$$

Where:

$V_{t,db,j}$ = Volumetric flow of the gaseous stream in time interval *t* on a dry basis for process *j* (in m^3 dry gas/h)

$M_{t,db,j}$ = Mass flow of the gaseous stream in time interval *t* on a dry basis for process *j* (in kg/h)

$\rho_{t,db,j}$ = Density of the gaseous stream in time interval *t* on a dry basis for process *j* (in kg dry gas/m^3 dry gas)

The density of the gaseous stream in time interval *t* on a dry basis for process *j* ($\rho_{t,db,j}$) should be determined as follows:

$$\rho_{t,db,j} = P_{t,j} * MM_{t,db,j} / R_u * T_{t,j} \quad \textbf{(15)}$$

Where:

$P_{t,j}$ = Pressure of the gaseous stream in time interval *t* for process *j* for process *j* (in Pa)

$T_{t,j}$ = Temperature of the gaseous stream in time interval *t* for process *j* (in K)

$MM_{t,db,j}$= Molecular mass of the gaseous stream in a time interval *t* on a dry basis for process *j* (in kg dry gas/kmol dry gas). The molecular mass of the gaseous stream ($MM_{t,db,j}$) is estimated by using equation (11).

Determination of the absolute humidity of the gaseous stream

While absolute humidity is a parameter required for Options B and E only, it will thus be used/determined only in case Option B is applied (as Option E is not selected as a measurement option for CPA-1 Santa Rosa).

Option 2 of the methodological tool is selected for the CPA:

Option 2: Simplified calculation without measurement of the moisture content

This option provides a simple and conservative approach to determine the absolute humidity by assuming the gaseous stream is dry or saturated depending on which is the conservative situation. If it is conservative to assume that the gaseous stream is dry, then $m_{H2O,t,db}$ is assumed to equal 0. If it is conservative to assume that the gaseous stream is saturated, then $m_{H2O,t,db}$ is assumed to equal the saturation absolute humidity ($m_{H2O,t,db,sat}$) and calculated using equation (7).

$$m_{H_2O,t,db,sat} = \frac{p_{H2O,t,Sat} * MM_{H2O}}{(P_{t,j} - p_{H2O,t,Sat}) * MM_{t,db}} \quad \textbf{(16)}$$

Where:

$m_{H2O,t,db,sat}$ = Saturation absolute humidity in time interval *t* on a dry basis (in kg H_2O/kg dry gas)

$p_{H20,t,sat}$ = Saturation pressure of H_2O at temperature $T_{t,j}$ in time interval *t* (in Pa)

$T_{t,j}$ = Temperature of the gaseous stream in time interval *t* for process *j* (in K)

$P_{t,j}$ = Absolute pressure of the gaseous stream in time interval *t* for process *j* (in Pa)

MM_{H2O} = Molecular mass of H_2O (in kg H_2O/kmol H_2O)

$MM_{t,db}$ = Molecular mass of the gaseous stream in a time interval *t* on a dry basis (in kg dry gas/kmol dry gas). $MM_{t,db}$ is estimated by using equation (11).

Determination of $PE_{flare,y}$ (required for the determination of $F_{CH4,flared,y}$):
As established by ACM0001 (version 19.0), $PE_{flare,y}$ is determined by following applicable guidance of the methodological tool "Project emissions from flaring" (version 03.0).

The calculation procedure in the referred methodological tool is applied to determine project emissions from flaring the residual gas ($PE_{flare,y}$) based on the flare efficiency ($\eta_{flare,m}$) and the mass flow of methane to the flare in question ($F_{CH4,RG,m}$). The flare efficiency is determined for each minute *m* of year *y* based either on monitored data or default values.

Calculation procedure for the determination of project emissions from flaring applied as follows under a stepwise approach:

STEP 1: Determination of the methane mass flow of the residual gas;

STEP 2: Determination of the flare efficiency;

STEP 3: Calculation of project emissions from flaring.

Step 1: Determination of the methane mass flow in the residual gas:

The methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" shall be used to determine, in kg, the mass flow of methane in the residual gaseous stream in the minute *m*: $F_{CH4,m}$.

The following requirements apply for the determination of the mass flow of methane in the gaseous stream in minute *m*:

- The "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" shall be applied to the residual gas.
- The flow of the gaseous stream shall be measured continuously;
- CH_4 is the greenhouse gas *i* for which the mass flow should be determined;
- The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the methodological tool); and
- The time interval *t* for which mass flow should be calculated is every minute *m*.

$F_{CH4,m}$, which is measured as the mass flow during minute *m*, shall then be used to determine the mass of methane in kilograms fed to the flare in minute *m* ($F_{CH4,RG,m}$). $F_{CH4,m}$ shall be determined on a dry basis.

Step 2: Determination of flare efficiency:

As required by ACM0001 (version 19.0), the flare efficiency values will be determined for the installed flare(s). Also, as per ACM0001 (version 19.0), flare efficiency represents the combustion efficiency of LFG in the flare in terms of CH_4 by considering *inter alia* the time that the flare in question is operating. For determining the combustion efficiency for the enclosed flare in question, there is the option to apply a default efficiency value or determining the flare efficiency based on monitored data (based on applicable measurements and calculations).

The time each one of the project's high temperature enclosed flare has operated is determined by monitoring the flame combustion status/condition by using a flame detector and, for the case of enclosed high temperature flares, the monitoring requirements related to operational requirements/conditions (as provided by the manufacturer's specifications for operating conditions) shall be met in addition to the confirmation of flare status/condition.

The flare efficiency for each minute *m* ($\eta_{flare,m}$) will be determined by following applicable guidance of one of the options provided by the methodological tool "Project emissions from flaring" as follows:

Option A: Apply default value for flare efficiency.

Option B: Measure the flare efficiency.

Option A: Application of default value:
The flare efficiency for each minute *m* ($\eta_{flare,m}$) is 90% when the following two operational conditions/requirements are simultaneously met (in order to demonstrate that the flare is operating as per the recommendations and requirements set by the equipment manufacturer for the minute *m* in question):

(1) The temperature of the exhaust gases of the flare (monitoring parameter $T_{EG.m}$) and the flow rate of LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification/requirements for the flare (monitoring parameter $SPEC_{flare}$) in minute *m*;

(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

If for the minute *m*, conditions (1) and/or (2) are not met, $\eta_{flare,m}$ is set as 0% for the minute in question

Option B: Measured flare efficiency:
The flare efficiency in the minute *m* is determined as a value which is calculated based on performed related measurements ($\eta_{flare,m} = \eta_{flare,calc,m}$) when the following two conditions are simultaneously met (in order to demonstrate that the flare is operating):

(1) The temperature of the exhaust gas of the flare (monitoring parameter $T_{EG.m}$) and the flow rate LFG to the flare (monitoring parameter $F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute *m*;

(2) Flame is detected in the flare in minute *m* (monitoring parameter $Flame_m$).

Otherwise $\eta_{flare,m}$ is set as 0%.

Option B.2: Measurement of flare efficiency in each minute

The flare efficiency in the minute m is a measured value ($\eta_{flare,m} = \eta_{flare,calc,m}$) when the following three conditions are met to demonstrate that the flare is operating:
(1) The temperature of the flare ($T_{EG.m}$) and the flow rate of the residual gas to the flare ($F_{RG,m}$) is within the manufacturer's specification for the flare ($SPEC_{flare}$) in minute *m*;

(2) The flame is detected in minute *m* ($Flame_m$); and

Otherwise $\eta_{flare,m}$ is 0%.

The flare efficiency ($\eta_{flare,calc,m}$) is determined based on monitoring the methane content in the exhaust gas, the residual gas, and the air used in the combustion process during the minute *m* in year *y*. In case this Option is adopted, the flare efficiency for minute m will be calculate by following the provisions of the methodological tool "Project emissions from flaring" (version 03.0) as follows:

$$\eta_{flare,calc,m} = 1 - \frac{F_{CH4,EG,m}}{F_{CH4,RG,m}} \quad \textbf{(17)}$$

Where:

$\eta_{flare,calc,m}$ Flare efficiency in the minute *m*

$F_{CH4,EG,m}$ Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m* (in kg)

$F_{CH4,RG,m}$ Mass flow of methane in the residual gas on a dry basis at reference conditions in the minute *m* (in kg)

Step 2.1: Determine the methane mass flow in the exhaust gas on a dry basis

The mass flow of methane in the exhaust gas is determined based on the volumetric flow of the exhaust gas and the measured concentration of methane in the exhaust gas, as follows:

$$F_{CH4,EG,m} = V_{EG,m} \times fc_{CH4,EG,m} \times 10^{-6} \quad \textbf{(18)}$$

Where:

$V_{EG,m}$ Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m* (in kg)

$fc_{CH4,EG,m}$ Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in minute *m* (in mg/m^3)

Step 2.2: Determine the volumetric flow of the exhaust gas ($V_{EG,m}$)
Determine the average volume flow of the exhaust gas in minute *m* based on a stoichiometric calculation of the combustion process. This depends on the chemical composition of the residual gas, the amount of air supplied to combust it and the composition of the exhaust gas. It is calculated as follows:

$$V_{EG,m} = Q_{EG,m} \times M_{RG,m} \quad \textbf{(19)}$$

Where:

$Q_{EG,m}$ Volume of the exhaust gas on a dry basis at reference conditions per kilogram of residual gas on a dry basis at reference conditions in minute *m* (in m^3 exhaust gas/kg residual gas)

$M_{RG,m}$ Mass flow of the residual gas on a dry basis at reference conditions in the minute *m* (in kg)

Step 2.3: Determine the mass flow of the residual gas ($M_{RG,m}$)
The coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer may select to monitor the mass flow of the residual gas in minute *m* directly (see monitored parameter $M_{RG,m}$) or, according to the procedure given in this step, calculate $M_{RG,m}$ based on the volumetric flow and the density of the residual gas. The density of the residual gas is determined based on the volumetric fraction of all components in the gas.

$$M_{RG,m} = \rho_{RG,ref,m} \times V_{RG,m} \quad \textbf{(20)}$$

Where:

$P_{RG,ref,m}$ Density of the residual gas at reference conditions in minute *m* (in kg/m^3)

$V_{RG,m}$ Volumetric flow of the residual gas on a dry basis at reference conditions in the minute *m* (in m^3)

And

$$\rho_{RG,ref,m} = \frac{P_{ref}}{\frac{R_u}{MM_{RG,m}} \times T_{ref}} \quad \textbf{(21)}$$

Where:

P_{ref} Atmospheric pressure at reference conditions (in Pa)

R_u (universal ideal gas constant (in $Pa.m^3/kmol.K$)

$MM_{RG,m}$ Molecular mass of the residual gas in minute *m* (kg/kmol)

T_{ref} Temperature at reference conditions (K)

Use the equation below to calculate $MM_{RG,m}$. When applying this equation, The coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer may choose to either a) use the measured volumetric fraction of each component *i* of the residual gas, or b) as a simplification, measure the volumetric fraction of methane and consider the difference to 100% as being nitrogen (N_2). The same equation applies, irrespective of which option is selected.

$$MM_{RG,m} = \sum_t \left(v_{i,RG,m} \times MM_i \right) \quad \textbf{(22)}$$

Where:

MM_i molecular mass of residual gas in minute *m* (in kg/kmol)
$V_{t,RG,m}$ Volumetric fraction of component *i* in the residual gas on a dry basis at reference conditions in the hour *h*

i Components of the residual gas. If Option (a) is selected to measure the volumetric fraction, then I = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_3, N_2 or if Option (b) is selected then i = CH_4 and N_2.

Step 2.4: Determine the volume of the exhaust gas on a dry basis at reference conditions per kilogram of residual gas ($Q_{EG,m}$)

$Q_{ECO2,EG,m}$ shall be determined as follows:

$$Q_{EG,m} = Q_{CO2,EG,m} + Q_{O_2,EG,m} + Q_{N_2,EG,m} \quad \textbf{(23)}$$

$Q_{ECO2,EG,m}$ Volume of the exhaust gas on a dry basis per kg of residual gas on a dry basis at reference conditions in the minute *m* (m^3/kg residual gas)

$Q_{CO2,EG,m}$ Quantity of CO_2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute *m* (m^3/kg residual gas)

$Q_{N2,EG,m}$ Quantity of N_2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute *m* (m^3/kg residual gas)

$Q_{O2,EG,m}$ Quantity of O_2 volume in the exhaust gas per kg of residual gas on a dry basis at reference conditions in the minute *m* (m^3/kg residual gas)

with

$$Q_{O_2,EG,m} = n_{O2,EG,m} \times VM_{ref} \quad \textbf{(24)}$$

Where:

$n_{O2,EG,m}$ Quantity of O_2 (moles) in the exhaust gas per kg of residual gas flared on a dry basis at reference conditions in minute *m* (kmol/kg residual gas)

VM_{ref} Volume of one mole of any ideal gas at reference temperature and pressure (m^3/kmol)

$$Q_{N_2,EG,m} = VM_{ref} \times \left\{ \frac{MF_{N,RG,m}}{2 \times AM_N} + \left(\frac{1 - v_{O2,air}}{v_{O2,air}} \right) \times \left[F_{O2,RG,m} + n_{O2,EG,m} \right] \right\} \quad \textbf{(25)}$$

Where:

$MF_{N,RG,m}$ Mass fraction of nitrogen in the residual gas in the minute *m*

AM_N Atomic mass of nitrogen (kg/kmol)

$v_{O2,air}$ Volumetric fraction of O_2 in air

$F_{O2,RG,m}$ Stochiometric quantity of moles of O_2 required for a complete oxidation of one kg residual gas in minute *m* (kmol/kg residual gas)

$$Q_{CO2,EG,m} = \frac{MF_{C,RG,m}}{AM_C} \times VM_{ref} \quad \textbf{(26)}$$

Where:

$MF_{C,RG,m}$ Mass fraction of carbon in the residual gas in the minute m

AM_C Atomic mass of carbon (kg/kmol)

VM_{ref} Volume of one mole of any ideal gas at reference temperature and pressure (m^3/kmol)

$$n_{O2,EG,m} = \frac{v_{O2,EG,m}}{\left(1-\left(v_{O2,EG,m} / v_{O2,air}\right)\right)} \times \left[\frac{MF_{C,RG,m}}{AM_c} + \frac{MF_{N,RG,m}}{2 \times AM} + \left(\frac{1-v_{O2,air}}{v_{O2,air}}\right) \times F_{O2,RG,m}\right] \quad \textbf{(27)}$$

Where:

$v_{O2,EG,m}$ Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute *m*

$MF_{C,RG,m}$ Mass fraction of carbon in the residual gas in the minute m

$MF_{N,RG,m}$ Mass fraction of nitrogen in the residual gas in the minute m

AM_N Atomic mass of nitrogen (kg/kmol)

$$F_{O2<RG,m} = \frac{MF_{C,RG,m}}{AM_C} + \frac{MF_{H,RG,m}}{4AM_H} - \frac{MF_{O,RG,m}}{2AM_O} \quad \textbf{(28)}$$

Where:

$MF_{O,RG,m}$ Mass fraction of oxygen in the residual gas in the minute m

AM_O Atomic mass of oxygen (kg/kmol)

$MF_{H,RG,m}$ Mass fraction of hydrogen in the residual gas in the minute m

AM_H Atomic mass of hydrogen (kg/kmol)

Determine the mass fractions of carbon, hydrogen, oxygen and nitrogen in the residual gas, using the volumetric fraction of component *i* in the residual gas and applying the equation below. In applying this equation, the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer may choose to either a) use the measured volumetric fraction of each component *i* of the residual gas, or (b) as a simplification, measure the volumetric fraction of methane and consider the difference to 100% as being nitrogen (N_2). The same equation applies, irrespective of which option is selected.

$$MF_{j,RG,m} = \frac{\sum_i v_{i,RG,m} \times AM_j \times NA_{j,i}}{MM_{RG,m}} \quad \textbf{(29)}$$

Where:

$MF_{j,RG,m}$ Mass fraction of element *j* in the residual gas in the minute *m*

$v_{i,RG,m}$ Volumetric fraction of component *i* in the residual gas on a dry basis in the minute *m*

AM_j Atomic mass of element *j* (kg/kmol)

$NA_{j,i}$ Number of atoms of element *j* in component *i*

$MM_{RG,m}$ Molecular mass of the residual gas in minute m (kg/kmol)

j Elements C, O, H and N

i Component of residual gas. If Option (a) is selected to measure the volumetric fraction, then *i* = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_3, N_2 or if Option (b) is selected then *i* = CH_4 and N_2

As also established by the methodological tool "Project emissions from flaring" (version 03.0), for enclosed flares that are defined as low height flares, determined every-minute the flare efficiency values shall be adjusted, as a conservative approach, by subtracting 10 percentile points.

Step 3: Calculation of project emissions from flaring:
Project emissions from flaring are calculated as the sum of emissions for each minute *m* in year *y*, based on the methane mass flow in the residual gas ($F_{CH4,RG,m}$) and the flare efficiency ($\eta_{flare,m}$), as follows:

$$PE_{flare,y} = GWP_{CH4} * \sum_{m=1}^{525,600} F_{CH4,RG,m} * (1 - \eta_{flare,m}) * 10^{-3} \quad \textbf{(30)}$$

Where:

$PE_{flare,y}$ = Project emissions from flaring of the residual gas in year *y* (in tCO_{2e})

GWP_{CH4} = Global warming potential of methane valid for the commitment period (in tCO_{2e}/tCH_4)

$F_{CH4,RG,m}$ = Mass flow of methane in the residual gas in the minute *m* (in kg)

$\eta_{flare,m}$ = Flare efficiency in minute *m*

Ex ante estimation of $F_{CH4,PJ,y}$

An *ex-ante* estimate of $F_{CH4,PJ,y}$ is required to estimate methane baseline emissions in order to estimate the emission reductions to be achieved by CPA-1 Santa Rosa. As established by ACM0001 (version 19.0), $F_{CH4,PJ,y}$ is estimated as follows:

$$F_{CH4,\ PJ,\ y} = \eta_{PJ} * BE_{CH4,\ SWDS,\ y} / GWP_{CH4} \quad \textbf{(31)}$$

Where:

$F_{CH4,PJ,y}$	=	Amount of methane in the LFG which is flared and/or used by CPA-1 Santa Rosa in year *y* (in tCH_4)
$BE_{CH4,SWDS,y}$	=	Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (in tCO_2e)
η_{PJ}	=	Efficiency of the LFG capture system installed under CPA-1 Santa Rosa
GWP_{CH4}	=	Global warming potential of CH_4 (in tCO_2e/tCH_4)

$BE_{CH4,SWDS,y}$ is determined using the methodological tool "Emissions from solid waste disposal sites" (version 08.8). The following guidance should be taken into account when applying the methodological tool:

- f_y as per the methodological tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for when applying ACM0001 (version 19.0);
- In the methodological tool, *x* begins with the year that the SWDS started receiving wastes (e.g. the first year of SWDS operation); and
- Sampling to determine the fractions of different waste types is not necessary because the waste composition can be obtained from previous studies.

Thus, for the ex-ante estimation of the amount of methane destroyed/combusted by CPA-1 Santa Rosa ($F_{CH4,PJ,y}$) during each year y of its 2nd 7-year crediting crediting period, the calculation of $BE_{CH4,SWDS,y}$ is given by:

$$BE_{CH4,SWDS,y} = \varphi_y * (1 - f_y) * GWP_{CH4} * (1 - OX) * \frac{16}{12} * F * DOC_{f,y} * MCF_y * \sum_{x=1}^{y} \sum_{j} W_{j,x} * DOC_j * e^{-k_j * (y-x)} * (1 - e^{-k_j}) \quad \textbf{(32)}$$

Where:

$BE_{CH4,SWDS,y}$	= Baseline methane emissions occurring in year *y* generated from waste disposal at a SWDS during a time period ending in year *y* (in tCO_2e / yr)
x	= Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (*x* = 1) to year *y* (*x* = *y*)
y	= Year of the crediting period for which methane emissions are calculated (*y* is a consecutive period of 12 months)
$DOC_{f,y}$	= Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year *y* (weight fraction)
$W_{j,x}$	= Amount of solid waste type *j* disposed or prevented from disposal in the SWDS in the year *x* (t)

φ_y = Model correction factor to account for model uncertainties for year *y*. The default value (as per Option 1 of applicable guidance in the methodological tool) is selected. Thus, $\varphi_y = \varphi_{default}$

f_y = Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year *y*. f_y in the methodological tool "Emission from solid waste disposal sites" shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for when applying ACM0001 (version 19.0). While as per the methodological tool "Emissions from solid waste disposal sites" (version 08.0), f_y is presented as a parameter to be monitored ex-post; by considering the related methodological approach of ACM0001 (version 19.0.) and assigned value for f_y, this parameter will thus not be monitored ex-post.

GWP_{CH4} = Global Warming Potential of methane

OX = Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

F = Fraction of methane in the SWDS gas (volume fraction)

MCF_y = Methane correction factor for year *y*

DOC_j = Fraction of degradable organic carbon in the waste type *j* (weight fraction)

k_j = Decay rate for the waste type *j* (1 / yr)

j = Type of residual waste or types of waste in the MSW

The value and source of information for each of the variables above are given in section B.4.2. It is important to note that the approach to take into account characteristics of the disposed waste (used as inputs for the ex-ante estimation) are the ones recommended by IPCC. Due to that, no sampling of waste is necessary. This is in accordance with both the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and ACM0001 (version 19.0).

Details about the determination of $BE_{CH4,SWDS,y}$ in the context of the calculation of ex-ante estimations of emission reductions to be achieved by CPA-1 Santa Rosa is included in Section B.4.3.

Determination of $F_{CH4,BL,y}$

As required by ACM0001 (version 19.0), this step represents the application of the stepwise procedure for the determination of the amount of methane that would have been captured and destroyed in the baseline scenario at the solid waste disposal site (SWDS) hosting the CPA due to eventually applicable regulatory or contractual requirements and/or to address eventually existent applicable safety and odors concerns (which are collectively referred to as "*requirement"* under this step).

The four cases summarized in the table below are distinguished in ACM0001 (version 19.0). As also required by ACM0001 (version 19.0), the appropriate case for the particular baseline context of CPA-1 Santa Rosa is identified and justified below:

Possible cases for determining methane captured and destroyed in the baseline as per ACM0001 (version 19.0)

Situation at the start of CPA-1 Santa Rosa	Requirement to destroy methane	Existing LFG capture and destruction system
Case 1	No	No
Case 2	Yes	No
Case 3	No	Yes
Case 4	Yes	Yes

Requirement to destroy methane:

Non-existence of regional, national regulatory or contractual requirements related to LFG management in the region where CPA-1 Santa Rosa is implemented and/or in the rest of the host country Brazil:

Like the situation valid prior to the start of the 1st 7-year crediting period of CPA-1 Santa Rosa and during the whole period encompassing its currently expired 1st 7-year crediting period, currently there is still being not legally obliged to promote any kind of capture and/or destruction/utilization of LFG at CTR Santa Rosa landfill[34]. Furthermore, this situation is currently not expected to be changed

[34] The latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa outlines the following regarding combustion of LFG in the absence of CPA-1 Santa Rosa (at the time of the occurred initial CPA design conceptualization):

> *"For the case of the CTR Santa Rosa landfill site, which is located in the state of Rio de Janeiro, the environmental agency of the state does not require the landfill to install any landfill gas collection and flare system, including passive flaring. This is the common practice in the state of Rio de Janeiro. As a result the term AF is equal to zero, and hence $MD_{BL,y}$ is equal to zero."*

In August/2020, there was still no legal requirement for LFG gas collection and its destruction using active or passive high temperature enclosed flare(s) in Brazil. Moreover, there was still no legal restriction neither requirement for passive venting of LFG or its combustion in conventional LFG destruction systems. Actually, there is still no applicable regulation that deals with LFG management in Brazil. The recently implemented National Policy on Waste Management does not deal with LFG management either.

Some facts about the Brazilian National Policy on Waste Management: After years of studies and negotiations, the Brazilian Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on 02/08/2010 and entered into force on 23/12/2010. This decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. This new Brazilian Regulation of the National Policy on Waste Management does not establish any requirement, obligation or recommendation related to LFG management at landfills in Brazil. The following is outlined by the law firm "Tauil & Chequer Advogados" in an article published in year 2011 of which content remains being valid:

> *"(...) The Regulation of the National Policy on Waste Management, established by Decree No. 7,404/10 (the Decree), was published on December 23, 2010. In force since its publication, the Decree regulates the National Policy on Waste Management (PNRS), established by Federal Law No. 12,305/10 (the LPNRS), and creates the Steering Committee for the Implementation of Reverse Logistics Systems (Steering Committee) and the PNRS Interministerial Committee. The main purpose of the PNRS Interministerial Committee is to support the PNRS structuring and implementation, in order to enable the accomplishment of the provisions and goals set forth by the LPNRS. The Steering Committee has the basic function of guiding the implementation of reverse logistics. Among the instruments regulated by the Decree are the Reverse Logistics Systems, the Waste Management Plans (PGRS) and the National Registry for Hazardous Waste Operators. The Decree lists three specific instruments for the implementation and operation of the reverse logistic systems: (i) sectorial agreements, executed between public authorities and the industry; (ii) regulations, issued by the executive branch; and (iii) commitment agreements—which are to be adopted in the absence of sectorial agreements and regulations and when specific circumstances require more restrictive obligations—to be approved by the competent environmental agency. Regarding the obligation to prepare a PGRS, which should be required within environmental permitting proceedings, the Decree mentions the possibility of jointly submitting the PGRS under specific conditions and in cases where activities are conducted in the same condominium, municipality, micro-region or metropolitan/urban areas. Additionally, the Decree establishes that small companies that generate household waste, as provided for by article 30 of the LPNRS, are not required to submit a PGRS. Regarding the National Registry for Hazardous Waste Operators, which must be integrated to the already existing Federal*

during the time period to be encompassed by the 2nd 7-year crediting period of CPA-1 Santa Rosa either.

Non-existence of requirements to destroy methane due to safety or odor concerns: In the case of CTR Santa Rosa landfill, there are no applicable requirements to destroy methane at the Querétaro landfill due to safety or odor concerns either.

In the particular case of the CTR Santa Rosa landfill, as per design and licensing requirements applicable for this particular landfill, no LFG was ever required to be destroyed by combustion in order to address odors or safety concerns or any other type of concern.
Thus, in the absence of CPA-1 Santa Rosa, direct venting of LFG through pre-project LFG venting drains (with no combustion) would remain being enough to prevent dangerous accumulation of LFG in the inner section of the landfill.

While as per the methodological approach of ACM0001 (version 19.0) for determination of $F_{CH4,BL,y}$ any destruction of LFG to address safety and/or odor concerns and/or other concern would be regarded as an existing requirement to destroy methane, it is thus assumed that, in the particular case of the CTR Santa Rosa landfill, there is no requirement to destroy methane.

The following is thus applicable: *"Requirement to destroy methane: NO*".

By taking this assumption into account, Case 2 and Case 4 (*Requirement to destroy methane? = Yes*) are thus both directly regarded as not applicable for the determination of $F_{CH4,BL,y}$.

Non-existence of LFG capture and destruction system at the CTR Santa Rosa landfill:

As outlined in Section B.3 and in Appendix 3, until year 2012 (prior of the starting of operations of CPA-1 Santa Rosa), as a result of the non-existence of any requirements to destroy methane at the CTR Santa Rosa landfill, this landfill site was under regular operation with no LFG being combusted[35].

As a conclusion, by taking into account the definitions of "*LFG capture system*" and "*existing LFG capture system*" as per ACM0001 (version 19.0)[36], it is thus assumed that there was no existing LFG capture system at the CTR Santa Rosa landfill prior to the implementation of CPA-1 Santa Rosa. Therefore, Case 3 is also regarded as not applicable.

Technical Registry of IBAMA, the Decree establishes a registration obligation for companies that manipulate or operate hazardous waste. The Decree also describes those who are considered generators or operators of hazardous waste, establishing several requirements for their authorization or permitting. These include the preparation of hazardous waste management plan, the demonstration of technical and economic capacity and the obtaining of civil liability insurance for environmental damages." [SIC]

Paper is available online: http://www.tauilchequer.com.br/publications/detailprint.aspx?publication=1179

[35] The latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa outlines the following regarding combustion of LFG in the absence of CPA-1 Santa Rosa (at the time of the occurred initial CPA design conceptualization):

"CTR Santa Rosa landfill is still being constructed and there are no plans to implement a LFG collection system without CDM registry."

[36] As per ACM0001 (version 19.0), "*LFG capture system*" is defined as follows:
"*A system to capture LFG. The system may be passive, active or a combination of both active and passive components. Passive systems capture LFG by means of natural pressure, concentration, and density gradients. Active systems use mechanical equipment to capture LFG by providing pressure gradients. Captured LFG can be vented, flared or used."*

As per ACM0001 (version 19.0), "*existing LFG capture system*" is defined as follows:
"*An existing active LFG capture system is a system that has been in operation in the last calendar year prior to the start of the operation of the project activity."*

In summary, the only option/case applicable for the CTR Santa Rosa landfill (in the absence of CPA-1 Santa Rosa) is Case 1.

The following is thus valid in the context of the application of the stepwise procedure for the determination of $F_{CH4,BL,y}$ for CPA-1 Santa Rosa during its 2nd 7-year crediting period:

- Requirement to destroy methane = NO
- Existing LFG capture and destruction system = NO

By taking into account applicable guidance of ACM0001 (version 19.0) for Case 1, $F_{CH4,Bl,y}$ is thus directly determined as follows:

$$F_{CH4,BL,y} = 0 \quad \textbf{(33)}$$

Determination of $BE_{EC,y}$

The following is defined by ACM0001 (version 19.0) regarding the determination of baseline emissions associated with electricity generation ($BE_{EC,y}$)

> *"The baseline emissions associated with electricity generation in year y ($BE_{EC,y}$) shall be calculated using the "Methodological tool: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation". When applying the tool:*
>
> *(a) The electricity sources k in the tool correspond to the sources of electricity generated identified in the selection of the most plausible baseline scenario; and*
>
> *(b) $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year y ($EG_{PJ,y}$).*

While in the particular case of CPA-1 Santa Rosa, in the particular case of determination of $BE_{EC,y}$, electricity sources *k* represent grid-sourced electricity only, $BE_{EC,y}$ is thus determined (in tCO_2/yr) as per the formula presented below and by assuming Scenario A of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) as being applicable:

$$BE_{EC,y} = EC_{BL,y} * EF_{EL,grid,BL,y} * (1 + TDL_{grid,y}) \quad \textbf{(34)}$$

Where:

$TDL_{grid,y}$ = Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by CPA-1 Santa Rosa in year *y*.

$EC_{BL,y}$ = Net amount of electricity generated using LFG in year *y* (in MWh).

$EF_{EL,grid,BL,y}$ = Emission factor for grid sourced electricity for baseline emissions in year y (in tCO_2/MWh). $EF_{EL,grid,BL,y}$ is determined ex-ante by applying the following option of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0):

- Option A.2: $EF_{EL,grid,y}$ is directly determined as the conservative default value of the methodological tool "Baseline, project and/or leakage

emissions from electricity consumption and monitoring of electricity generation" (version 03.0) applicable for electricity generated by CPA-1 Santa Rosa which is exported to the electricity grid to which the CPA is connected to.

As per Option A.2 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) the requirement of the methodological tool is considered:

> *"Option A2: Use the following conservative default values:*
>
> *(a) A value of 1.3 tCO_2/MWh if:*
>
> *(i) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or*
>
> *(ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the project and leakage sources is greater than the electricity consumption of the baseline sources;*
>
> *(b) A value of 0.4 tCO_2/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production, and a value of 0.25 tCO_2/MWh for other electricity grids. These values can be used if:*
>
> *(i) Scenario A applies only to baseline electricity consumption sources but not to project or leakage electricity consumption sources; or*
>
> *(ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the baseline sources is greater than the electricity consumption of the project and leakage sources."*

The electricity grid to which CPA-1 Santa Rosa is connected to is the Brazil's National Electricity Grid. As per official data summarized below from the Ministry of Energy[37], hydro power plants constitute more than

[37] Share of electricity generation from hydro source within total electricity generation within the 5 most recent years in Brazil (for which data is currently available):

50% of total grid generation in average of the five most recent years for this particular electricity grid. Furthermore, in the particular context of the determination of $EF_{EL,grid,BL,y}$ to be used for the determination of $BE_{EC,y}$ (where $EC_{BL,k,y}$ in the methodological tool is equivalent to the net amount of electricity generated by CPA-1 Santa Rosa using LFG in year *y*), electricity consumption of the baseline sources is regarded as greater than the electricity consumption of the project and leakage sources[38]. Thus, 0.25 tCO_2/MWh value is ex-ante selected as the applicable value for $EF_{EL,grid,BL,y}$ in the particular case of determination of baseline emissions associated with generation of electricity by the CPA when using Option A.2. Further details are presented in Section B.4.2.

Brazil electricity generation by source (GWh)

	2015	2016	2017	2018	2019
Total	**581,486**	**578,898**	**587,962**	**601,396**	**626,324**
Hydropower	359,743	380,911	370,906	388,971	397,877
Share over total electricity generation	62%	66%	63%	65%	64%
Natural Gas	79,503	56,550	65,591	54,295	60,188
Petroleum Products	25,708	12,207	12,911	10,293	7,846
Coal	19,096	17,001	16,257	14,204	15,327
Nuclear	14,734	15,864	15,739	15,674	16,129
Biomass	47,394	49,236	49,385	51,876	52,111
Wind	21,626	33,489	42,373	48,475	55,986
Solar Power Plants	59	85	831	3,461	6,651
Others	13,623	13,554	13,968	14,147	14,210

Source: Online available data from "Anuário Estatístico de Energia Elétrica 2020 – Workbook" / Brazil's Ministry of Mines and Energy / Empresa de Pesquisas Energéticas:
https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/anuario-estatistico-de-energia-eletrica

[38] It is relevant to note that in the absence of CPA-1 Santa Rosa (baseline scenario) all electricity to be generated by the CPA is assumed as being otherwise generated by grid-connected electricity generation sources (incl. fossil fuel fired electricity generation facilities). Furthermore, also under the absence of CPA-1 Santa Rosa (baseline scenario) which represents the pre-project scenario, no electricity consumption was required for LFG management at the CTR Santa Rosa landfill (since there was no combustion of generated LFG in previously existent conventional passive LFG venting drains and no electricity demand for LFG management). Thus, by taking into account the electricity generation infrastructure of CPA-1 Santa Rosa (under its original design configuration) and its associated baseline emissions, it is deemed reasonable to consider electricity consumption of the baseline sources being regarded as greater than the electricity consumption of the project and leakage sources for the particular context of determination of $BE_{EC,y}$.

It is also relevant to note that, while there is no leakage sources to be considered by CPA-1 Santa Rosa, project emissions (associated with the consumption of grid-sourced electricity by the CPA) and baseline emissions (associated with export of generated electricity by the CPA) are determined separately (regardless of the fact that, under practical and operational circumstances of CPA-1 Santa Rosa (under its original design configuration), a share of generated electricity may be consumed by the CPA for collecting and flaring LFG (self-consumption of electricity as part of the operation of the CPA), thus reducing the amount of grid-sourced electricity that would be accounted as imported from the grid proportionally.

Determination of $BE_{NG,y}$

As per ACM0001 (version 19.0), for the supply of LFG to consumer(s) through natural gas distribution network the baseline scenario is directly assumed to be the supply with natural gas.

However, in the particular case of CPA-1 Santa Rosa, as further justified in Section A.1, displacement of natural gas by upgraded LFG which is supplied to consumer(s) through natural gas distribution network is not considered/regarded as an additional GHG abatement/mitigation measure for the CPA. Thus, $BE_{NG,y}$ is directly assumed as null during the 2nd 7-year crediting period of CPA-1 Santa Rosa.

Project Emissions:

Project emissions for CPA-1 Santa Rosa are determined as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{DT,y} \quad \textbf{(35)}$$

Where:

$PE_{EC,y}$ = Project emissions from consumption of electricity

$PE_{FC,j,y}$ = Project emissions from fossil fuel combustion

Determination of project emissions due to consumption of grid-sourced electricity ($PE_{EC,y}$):
Project emissions from electricity consumption ($PE_{EC,y}$) are calculated following the applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) as follows:

$$PE_{EC,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,PJ,y} * (1+ TDL_{grid,y}) \quad \textbf{(36)}$$

Where:

$EC_{PJ,grid,y}$ Quantity of grid electricity consumed by CPA-1 Santa Rosa during the year y (in MWh)

$TDL_{grid,y}$ Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by CPA-1 Santa Rosa in year *y*.

$EF_{EL,grid,PJ,y}$ Emission factor for grid sourced electricity for project emissions in year y (in tCO_2/MWh). $EF_{EL,grid,PJ,y}$ is determined ex-ante by applying the following option of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0):

- Option A.2: $EF_{EL,grid,PJ,y}$ is directly determined as the conservative default value of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) applicable for grid-sourced electricity consumed by CPA-1 Santa Rosa through the electricity grid to which the CPA is connected to. 1.3 tCO_2/MWh value is ex-ante selected as the applicable value for $EF_{EL,grid,PJ,y}$ in the particular case of determination of baseline emissions associated with generation of electricity by the CPA when using Option A.2. Further details are presented in Section B.4.2.

Determination of project emissions from consumption of fossil fuels due to the CPA (for purpose other than electricity generation and/or transportation of LFG) ($PE_{FC,y}$):

Since its start of operations, CPA-1 Santa Rosa has consumed Liquefied Petroleum Gas (LPG) for igniting the currently installed high temperature enclosed flares. As required by ACM0001 (version 19.0), project emissions from consumption of fossil fuels due to the CPA (for purpose other than electricity generation) ($PE_{FC,y}$) shall be calculated by following applicable guidelines of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel" (version 03.0). ACM0001 (version 19.0) establishes the following when applying this particular methodological tool:

- "*Processes j in the tool correspond to the sources of fossil fuel consumption due to the project activity other than for electricity generation or and any on-site transportation by trucks or cars;(…)".*

- *"If in the baseline a proportion of LFG is captured and flared ($F_{CH4,BL,y} > 0$), then the fossil fuels consumption used in calculation ($F_{Ci,j,y}$) should refer to the net of that consumed in the baseline. The determination of the amount of fossil fuels consumed in the baseline shall be transparently documented in the CDM-PDD."*

In the particular case of CPA-1 Santa Rosa, process *j* corresponds to the use of LPG for igniting the flares. Furthermore, while no fossil fuel has been used in the pre-project and baseline scenario for collecting and destroying LFG, the above-summarized requirement is thus not applicable.

Thus,

$$PE_{FC,y} = PE_{LPG,y} \quad \textbf{(37)}$$

Where:

$PE_{LPG,y}$ Project emissions due to the consumption of Liquefied Petroleum Gas by the CPA in year *y* (in tCO_2/year)

In order to determine $PE_{LPG,y}$, applicable guidance of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 03.0) is applied as follows:

$$PE_{LPG,y} = FC_{LPG,y} * COEF_{LPG,y} \quad \textbf{(38)}$$

Where:

$FC_{LPG,y}$ Quantity of LPG consumed (in ton LPG or m^3 LPG). $FC_{LPG,y}$ will be monitored ex-post based on measurements as per monitoring details included in Section B.4.1 and B.4.3.

$COEF_{LPG,y}$ CO_2 emission coefficient for LPG (in tCO_2/ton LPG or in tCO_2/m^3 LPG)).
$COEF_{LPG,y}$ is determined by following applicable guidance of Option B of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 03.0) as follows:

$$COEF_{LPG,y} = NCV_{LPG,y} * EF_{CO2,LPG,y} \quad \textbf{(39)}$$

Where:

$NCV_{LPG,y}$ Net calorific value of the fuel LPG (in GJ/ton LPG or in GJ/m^3 LPG). $NCV_{LPG,y}$ will be monitored ex-post as per monitoring details included in Section B.4.1 and B.4.3.

$EF_{CO2,LPG,y}$	CO_2 emission factor of fuel LPG (in tCO_2/GJ LPG). $EF_{CO2,LPG,y}$ will be monitored ex-post as per monitoring details included in Section B.4.1 and B.4.3.

Leakage

No leakage effects need to be accounted under the adopted methodology.

B.4.2. Data and parameters fixed ex ante

>>

Data / Parameter	**OX_{top_layer}**
Data unit	Dimensionless
Description	Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
Source of data	Consistent with how oxidation is accounted for in the methodological tool "Emissions from solid waste disposal sites" (version 08.0)
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	Default value as per the applied CDM baseline and monitoring methodology ACM0001 "Flaring or use of landfill gas" (version 19.0)
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	**GWP_{CH4}**
Data unit	tCO_2e/tCH_4
Description	Global Warming Potential of CH_4
Source of data	Applied value represents the default value as per both IPCC Fourth Assessment Report (AR4) and ACM0001 (version 19.0).
Value(s) applied	25
Choice of data or Measurement methods and procedures	Default value as per both IPCC Fourth Assessment Report (AR4) and ACM0001 (version 19.0).
Purpose of data	Calculation of baseline emissions.
Additional comment	The applied value shall be updated according to any future COP/MOP decisions and/or decision by the CDM-EB.

Data / Parameter	**η_{PJ}**
Data unit	Dimensionless
Description	Efficiency of the LFG capture system under CPA-1 Santa Rosa
Source of data	Default value as per ACM0001 (version 19.0)
Value(s) applied	50%

Choice of data or Measurement methods and procedures	Selected value represents the applicable default value as per ACM0001 (version 19.0).
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa).
Additional comment	-

Data / Parameter	**f_y**
Data unit	Dimensionless
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y
Source of data	Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured
Value(s) applied	0
Choice of data or Measurement methods and procedures	According to ACM0001 (version 19.0), f_y in the methodological tool shall be assigned a value of 0 because the amount of LFG that would have been captured and destroyed is already accounted for in equation (2) of the methodology.
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa).
Additional comment	-

Data / Parameter	**OX**
Data unit	Dimensionless
Description	Oxidation factor (reflecting the amount of methane from the considered SWDS that is oxidized in the soil (or other material covering the waste))
Source of data	Applicable default value as per the methodological tool “Emissions from solid waste disposal sites” (version 08.0)
Value(s) applied	0.1
Choice of data or Measurement methods and procedures	-

Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	-

Data / Parameter	**F**
Data unit	Dimensionless
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	Applicable default value as per the methodological tool "Emissions from solid waste disposal sites" (version 08.0)
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the considered SWDS. A default value of 0.5 is recommended by IPCC.
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	-

Data / Parameter	**$DOC_{f,default}$**
Data unit	Dimensionless
Description	Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS.
Source of data	Applicable default value as per the methodological tool "Emissions from solid waste disposal sites" (version 08.0), which refers to applicable value as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value(s) applied	0.5
Choice of data or Measurement methods and procedures	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, in the SWDS. The default value was applied as per Application A of the methodological tool "Emissions from solid waste disposal sites" (version 08.0).
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	Application A of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) is the applicable case of CPA-1 Santa Rosa.

Data / Parameter	$MCF_{default}$
Data unit	Dimensionless
Description	Methane correction factor.
Source of data	Value is sourced by the methodological tool "Emissions from solid waste disposal sites" (version 08.0) that refers to IPCC 2006 Guidelines for National Greenhouse Gas Inventories.
Value(s) applied	1.0
Choice of data or Measurement methods and procedures	Value is selected as per Application A of the methodological tool, under the following conditions: "*1.0: for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste"* The day-to-day MSW disposal activities at the CTR Santa Rosa landfill encompasses utilization of appropriate MSW landfilling practices (covering, leveling and mechanical compacting of disposed material, etc.) as part of the operation of this landfill. The CTR Santa Rosa landfill is regarded as a well-managed landfill site.
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	-

Data / Parameter	DOC_j
Data unit	Dimensionless
Description	Fraction of degradable organic carbon in the waste type *j* (weight fraction)
Source of data	Values are selected as per applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0), that refers to IPCC 2006 Guidelines for National Greenhouse Gas Inventories, (adapted from Volume 5, Tables 2.4 and 2.5).

Value(s) applied	<table><tr><th>Waste type *j*</th><th>DOC_j (% wet waste)</th></tr><tr><td>Wood and wood products</td><td>43</td></tr><tr><td>Pulp, paper and cardboard (other than sludge)</td><td>40</td></tr><tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr><tr><td>Textiles</td><td>24</td></tr><tr><td>Garden, yard and park waste</td><td>20</td></tr><tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr></table>
Choice of data or Measurement methods and procedures	The selected values are based on wet waste basis (moisture concentrations in the waste streams as waste is delivered to the SWDS).
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	-

Data / Parameter	k_j
Data unit	1/yr
Description	Decay rate for the waste type *j*
Source of data	Values are selected as per applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0). The methodological tool refers to values as per IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3).
Value(s) applied	<table><tr><th>Degradation speed</th><th>Waste type</th><th>k_j</th></tr><tr><td rowspan="2">Slowly degrading</td><td>Wood, wood products</td><td>0.035</td></tr><tr><td>Pulp, paper and cardboard (other than sludge), textiles</td><td>0.07</td></tr><tr><td>Moderately Degrading</td><td>other (non-food) organic putrescible Garden, yard and park waste</td><td>0.17</td></tr><tr><td>Rapidly degrading</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.4</td></tr></table>
Choice of data or Measurement methods and procedures	Parameters are selected in accordance to the climate zone valid for the CTR Santa Rosa landfill.
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	Domestic sludge is assumed to be rapidly degrading and rubber and leather slowly degrading waste.

<table>
<tr><td>Data / Parameter</td><td>W_j</td></tr>
<tr><td>Data unit</td><td>Dimensionless</td></tr>
<tr><td>Description</td><td>Weight fraction of the waste type j</td></tr>
<tr><td>Source of data</td><td>Values are selected based on available records as per performed on site waste sampling analysis of which results are publicily available online:
Caracterização Gravimétrica e Microbiológica dos Resíduos Sólidos Domiciliares do Município do Rio de Janeiro – 2009:
http://comlurb.rio.rj.gov.br/download/caracteriza%C3%A7%C3%A3o%202009.pdf</td></tr>
<tr><td>Value(s) applied</td><td>
<table>
<tr><th>Waste type j</th><th>W_j
(% wet waste)</th></tr>
<tr><td>Wood and wood products</td><td>0.3</td></tr>
<tr><td>Pulp, paper and cardboard (other than sludge)</td><td>16.1</td></tr>
<tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>53.6</td></tr>
<tr><td>Textiles</td><td>1.9</td></tr>
<tr><td>Garden, yard and park waste</td><td>1.3</td></tr>
<tr><td>Glass, plastic, metal, other inert waste</td><td>26.8</td></tr>
</table>
</td></tr>
<tr><td>Choice of data or Measurement methods and procedures</td><td>-</td></tr>
<tr><td>Purpose of data</td><td>Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)</td></tr>
<tr><td>Additional comment</td><td></td></tr>
</table>

Data / Parameter	R_u
Data unit	Pa.m^3/kmol.K
Description	Universal ideal gases constant
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value(s) applied	8,314
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	MM_k
Data unit	kg/kmol
Description	Molecular mass of gas *k*
Source of data	Default values as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value(s) applied	For considered gases *k* that are greenhouse gases (GHGs), the value below is applied: The following is defined as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0): *"The determination of the molecular mass of the gaseous stream ($MM_{t,db}$) requires measuring the volumetric fraction of all gases (k) in the considered gaseous stream. However, as a simplification, only the volumetric fraction of gases k that are greenhouse gases and are considered in the emission reduction calculation in the underlying methodology must be monitored and the difference to 100% may be considered as pure nitrogen. The simplification is not acceptable if it is differently specified in the underlying methodology.* ACM0001 (version 19.0) does not include any restriction to such simplification. Thus, only the volumetric fraction of gases that are greenhouse gases and are considered in related calculations (CH_4 in the particular case of CPA-1 Santa Rosa) and the difference to 100% is just considered as pure nitrogen.
Choice of data or Measurement methods and procedures	-

Compound	Structure	Molecular mass (kg / kmol)
Nitrogen	N_2	28.01

Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	**MM_i**
Data unit	kg/kmol
Description	Molecular mass of greenhouse gas *i*
Source of data	Default values as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value(s) applied	The following values of molecular mass are applicable for CH_4 (the only GHG which is considered): Compound | Structure | Molecular mass (kg/kmol) Methane | CH_4 | 16.04
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	**P_n**
Data unit	Pa
Description	Total pressure at normal conditions
Source of data	Default value as per the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)
Value(s) applied	101,325
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	T_n
Data unit	K
Description	Temperature at normal conditions
Source of data	Default value as per the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)
Value(s) applied	273.15
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	MM_{H2O}
Data unit	kg/kmol
Description	Molecular mass of water
Source of data	Default value as per the methodological tool “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” (version 03.0)
Value(s) applied	18.0152
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$\varphi_{default}$
Data unit	Dimensionless
Description	Default value for model correction factor to account for model uncertainties
Source of data	Default value applicable for determination of baseline emissions as per the methodological tool “Emissions from solid waste disposal sites” (version 08.0).

Value(s) applied	0.75
Choice of data or Measurement methods and procedures	Determined based on default value applicable to application A while applying option 1 referred methodological tool.
Purpose of data	Calculation of baseline emissions (in the context of determination of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa)
Additional comment	-

Data / Parameter	**$SPEC_{flare}$**
Data unit	°C (for temperature values) Nm^3/h (for LFG flow values) Number of days (for maintenance schedule interval values)
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval.
Source of data	Flare manufacturer

Value(s) applied

Flare 1, Flare 2, Flare 3 and Flare 4[39]:

$SPEC_{flare, Flare 1}$	**Min.**	**Max.**
Operational LFG flow (for continuous operation):	500 Nm^3/h	2,500 Nm^3/h
Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):	500 ºC	1,200 ºC
Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material):	Min. every 6 months	
Required/recommended minimum frequency for replacement of the flare isolation ceramics revetment material:	After 10 years of regular and appropriate operation	

$SPEC_{flare, Flare 2}$ **$SPEC_{flare, Flare 3}$** **$SPEC_{flare, Flare 4}$**	**Min.**	**Max.**
Operational LFG flow (for continuous operation):	1,000 Nm^3/h	5,000 Nm^3/h
Required temperature of the exhaust gas of the flare (to ensure LFG destruction (combustion) under high CH_4 destruction efficiency):	500 ºC	1,200 ºC
Required minimum frequency for inspection and maintenance service (incl. inspection in the conditions of the flare isolation ceramics revetment material):	Min. every 6 months	
Required/recommended minimum frequency for replacement of the flare isolation ceramics revetment material:	After 10 years of regular and appropriate operation	

Choice of data or Measurement methods and procedures	

[39] Values applicable for the flares (as per the currently applicable configuration) are selected based on technical information/specifications details for the flares as provided by equipment manufacturers Hofstetter B.V. (Flare 1 and Flare 2) and Biotecnogas s.l.r. (Flare 3 and Flare 4).

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Choice of data or measurement methods and procedures	As established by the methodological tool "Project emissions from flaring" (version 03.0), the flare specifications and operational + maintenance requirements (as set/recommended by the equipment manufacturer) are documented and considered for the ex-ante determination of applicable values for the parameter $SPEC_{flare}$. During the 2nd 7-year crediting period of CPA-1 Santa Rosa, ex-ante selected data will be compared against monitored data related to the operation of the flares, including: a) Minimum and maximum monitoring records for data regarding inlet LFG flow rate, (b) Minimum and maximum monitoring records for data of temperature in the exhaust gas of each individual high temperature enclosed flare; and (c) Duration in days of time periods between maintenance events for each individual high temperature enclosed flare.
Purpose of data	Calculation of baseline emissions. Data is used as a reference for later ex-post determination of values of flare efficiency ($\eta_{flare,m}$) for each individual high temperature enclosed flare in the context of determination of baseline emissions[40].
Additional comment	All specification and operation details/requirements valid for the high temperature enclosed flares are based on information provided by the equipment manufacturer.

[40] It is important to note that residual project emissions of CH_4 due to the combustion of LFG in enclosed flares are considered in the context of the determination of baseline emissions (although ACM0001 (version 19.0) refers to the term "*project emissions from flaring*").

Data/Parameter	$EF_{EL,grid,BL,y}$
Data unit	tCO_2/MWh
Description	Emission factor for grid-sourced electricity for baseline emissions in year y
Source of data	Applicable default values as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)
Value(s) applied	0.25
Choice of data or measurement methods and procedures	The selection of the default value is under conformance with applicable guidance of ACM0001 (version 19.0). The emission factor for generated electricity exported through the electricity grid the CPA is connected to ($EF_{EL,grid,BL,y,}$) is determined by considering the following applicable guidance of Option A.2 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0): *"Option A2: Use the following conservative default values:* *(…)* *(b) A value of 0.4 tCO_2/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production, and a value of 0.25 tCO_2/MWh for other electricity grids. These values can be used if:* *(i) Scenario A applies only to baseline electricity consumption sources but not to project or leakage electricity consumption sources; or* *(ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the baseline sources is greater than the electricity consumption of the project and leakage sources."* The electricity grid to which the CPA is connected to is the Brazil's National Electricity Grid, for which hydro power plants constitute more than 50% of total grid generation in average of the five most recent years[41].

[41] Share of electricity generation from hydro source within total electricity generation within the 5 most recent years in Brazil (for which data is currently available):

Brazil electricity generation by source (GWh)

	2015	2016	2017	2018	2019
Total	**581,486**	**578,898**	**587,962**	**601,396**	**626,324**
Hydropower	359,743	380,911	370,906	388,971	397,877
Share over total electricity generation	62%	66%	63%	65%	64%
Natural Gas	79,503	56,550	65,591	54,295	60,188
Petroleum Products	25,708	12,207	12,911	10,293	7,846
Coal	19,096	17,001	16,257	14,204	15,327
Nuclear	14,734	15,864	15,739	15,674	16,129
Biomass	47,394	49,236	49,385	51,876	52,111
Wind	21,626	33,489	42,373	48,475	55,986
Solar Power Plants	59	85	831	3,461	6,651
Others	13,623	13,554	13,968	14,147	14,210

Source: Online available data from "Anuário Estatístico de Energia Elétrica 2020 – Workbook" / Brazil's Ministry of Mines and Energy / Empresa de Pesquisas Energéticas:
https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/anuario-estatistico-de-energia-eletrica

	Furthermore, in the particular context of the determination of $EF_{EL,grid,BL,y}$ to be used for the determination of baseline emissions of electricity generation ($BE_{EC,y}$) by CPA-1 Santa Rosa (under its original design configuration) (where $EC_{BL,k,y}$ in the methodological tool is equivalent to the net amount of electricity generated by the CPA using LFG in year *y* ($EC_{BL,y}$), electricity consumption of the baseline sources is regarded as greater than the electricity consumption of the project and leakage sources. In this particular context, it is relevant to note that, in the absence of CPA-1 Santa Rosa (baseline scenario), all electricity to be generated by the CPA is assumed as being otherwise generated by grid-connected electricity generation sources (incl. fossil fuel fired electricity generation facilities) and addition of new power generation sources. Furthermore, in the absence of CPA-1 Santa Rosa (baseline scenario) which represents the pre-project scenario, no electricity consumption was required for previous LFG management at the CTR Santa Rosa landfill (since there was no combustion of generated LFG in previously existent conventional passive LFG venting drains and no electricity demand for LFG management). Thus, by taking into account the electricity generation infrastructure of CPA-1 Santa Rosa and its associated baseline emissions, it is deemed reasonable to consider electricity consumption of the baseline sources being regarded as greater than the electricity consumption of the project and leakage sources for the particular context of determination of $BE_{EC,y}$. It is also relevant to note that, while there is no leakage sources to be considered by the CPA, project emissions (associated with the consumption of grid-sourced electricity by the CPA) and baseline emissions (associated with export of generated electricity by the CPA) are determined separately (regardless of the fact that, under practical and operational circumstances of CPA-1 Santa Rosa (under its original design configuration), a share of generated electricity may be consumed by the CPA for collecting and flaring LFG (as self-consumption of electricity) as part of the operation of the CPA, thus reducing the amount of grid-sourced electricity that would otherwise be proportionally accounted as imported from the grid.
Purpose of data	Calculation of baseline emissions (due to generation of electricity using LFG by CPA-1 Santa Rosa).
Additional comment	-

Data/Parameter	**$EF_{EL,grid,PJ,y}$**
Data unit	tCO_2/MWh
Description	Emission factor for grid-sourced electricity for project emissions in year y
Source of data	Applicable default values as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)
Value(s) applied	1.3
Choice of data or measurement methods and procedures	The selection of the default value is under conformance with applicable guidance of ACM0001 (version 19.0). The emission factor for grid-sourced electricity consumed by CPA-1 Santa Rosa through the electricity grid to which the CPA is connected to ($EF_{EL,grid,PJ,y,}$) is determined by considering the following applicable guidance of Option A.2 of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0): *"Option A2: Use the following conservative default values:* *(a) A value of 1.3 tCO_2/MWh if:* *(i) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or* *(ii) Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the project and leakage sources is greater than the electricity consumption of the baseline sources; (…)"*
Purpose of data	Calculation of project emissions (due to consumption of grid-sourced electricity by CPA-1 Santa Rosa).
Additional comment	-

B.4.3. Ex ante calculation of emission reductions

As outlined in Section B.4.1, while emission reductions to be achieved by CPA-1 Santa Rosa are determined as the difference between baseline emissions (BE_y) and project emissions (PE_y), as established by ACM0001 (version 19.0), the following relevant equations and conditions are applied for the ex-ante estimation of emission reductions to be achieved by the CPA during its 2nd 7-year renewable crediting period:

Determination of ex-ante estimations for baseline emissions (BE_y):

While CPA-1 Santa Rosa encompasses collection of LFG and its destruction/utilization in high temperature enclosed flare(s) and internal combustion engine generator sets of the project's electricity generation infrastructure, by following the applicable methodological approaches and assumptions + ex-ante determined values presented in Section B.4.1 and B.4.2 respectively, baseline emissions (BE_y) are thus determined as follows:

$$BE_y = BE_{CH4,y} + BE_{EC,y}$$

Where:

$BE_{CH4,y}$	= Baseline emissions of methane from the SWDS in year y (tCO_2e/yr)
$BE_{EC,y}$	= Baseline emissions associated with electricity generation in year y (tCO_2e/yr)

For the 2nd 7-year crediting period of CPA-1 Santa Rosa, $BE_{CH4,y}$ is determined as follows:

$$BE_{CH4,y} = ((1 - OX_{top\_layer}) * F_{CH4,PJ,y} - F_{CH4,BL,y}) * GWP_{CH4}$$

Where:

OX_{top_layer}	= Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline. OX_{top_layer} is ex-ante determined as 0.1. Further details about the determination of the applicable value of OX_{top_layer} are included in Section B.4.2.
$F_{CH4,BL,y}$	= Amount of methane that would be flared in the baseline in year y ($t\ CH_4/yr$). The value of $F_{CH4,BL,y}$ valid for the whole 2nd 7-year crediting period is 0 (null). Further details about the determination of $F_{CH4,BL,y}$ are included in Section B.4.1
GWP_{CH4}	= Global warming potential of CH_4 ($tCO_2e/t\ CH_4$). GWP_{CH4} is ex-ante determined as 25. Further details about the determination of the applicable value of GWP_{CH4} are included in Section B.4.2.
$F_{CH4,PJ,y}$	= Amount of methane in the LFG which is flared and/or used by CPA-1 Santa Rosa in year y (tCH_4/yr). In the context of ex-ante estimation of emission reductions, as established by ACM0001 (version 19.0), $F_{CH4,PJ,y}$ is determined (in tCH_4/year) as follows:

Determination of ex-ante estimations of $F_{CH4,PJ,y}$:

$$F_{CH4,\ PJ,\ y} = \eta_{PJ} * BE_{CH4,\ SWDS,\ y} / GWP_{CH4}$$

Where:

$F_{CH4,PJ,y}$ = Amount of methane in the LFG which is flared and/or used by CPA-1 Santa in year *y* (tCH_4/yr)

η_{PJ} = Efficiency of the LFG capture system that will be installed under CPA-1 Santa Rosa. η_{PJ} is ex-ante determined as 0.50. Further details about the determination of the applicable value of η_{PJ} are included in Section B.4.2.

$BE_{CH4,SWDS,y}$ = Amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* (in tCO_2e/yr). $BE_{CH4,SWDS,y}$ is estimated as follows:

$$BE_{CH4,SWDS,y} = \varphi_y * (1-f_y) * GWP_{CH4} * (1-OX) * \frac{16}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \sum_{j} W_{j,x} * DOC_j * e^{-k(y-x)} * (1-e^{-kj})$$

For the determination of $BE_{CH4,SWDS,y}$, the ex-ante determined values for all parameters in the formulae above are applied. Further details about the determination of such ex-ante determined values are included in Section B.4.2.

Regarding baseline emissions associated with electricity generation ($BE_{EC,y}$), related ex-ante estimates of emission reductions to be achieved within the 2nd 7-year crediting period of CPA-1 Santa Rosa (under its original design confuguration) are determined (in tCO_2/yr) as follows:

$$BE_{EC,y} = EC_{BL,y} * EF_{EL,grid,BL,y} * (1 + TDL_{grid,y})$$

Where:

$TDL_{grid,y}$ = Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by CPA-1 Santa Rosa in year *y*. For the particular case of determination of baseline emissions associated with electricity generation by CPA-1 Santa Rosa, $TDL_{grid,y}$ is assumed as being 3% ($TDL_{grid,export}$), which is the applicable default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) . Further details for the value determination are presented in Sections B.4.1 and B.5.1.

$EC_{BL,y}$ = Net amount of electricity generated using LFG in year *y* (in MWh). For the particular case of determination of baseline emissions associated with electricity generation by CPA-1 Santa Rosa (under its original design configuration), annual values for $EC_{BL,y}$ are estimated as follows:

Year	Value (in MWh)
2019	32,750
2020	135,840
2021	169,800
2022	169,800
2023	203,760
2024	203,760
2025	203,760
2026	154,634

Values for year 2019 and 2026 are applicable for the period from 05/10/2019 to 31/12/2019 and for the period from 01/01/2026 to 04/10/2026 respectively.

$EF_{EL,grid,BL,y}$ = Emission factor for grid sourced electricity in year *y* (in tCO_2/MWh). The 0.25 tCO_2/MWh default value is ex-ante selected as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0). Selected value represents the applicable default value for electricity generated by CPA-1 Santa Rosa and exported (through the electricity grid to which the CPA is connected to).
Further details for the value determination for $EF_{EL,grid,BL,y}$ are presented in Sections B.4.1 and B.4.2.

Project Emissions:

Project emissions are determined as follows:

$PE_y = PE_{EC,y} + PE_{FC,j,y}$

Where:
$PE_{EC,y}$ = Project emissions from consumption of electricity in the project case.

$PE_{FC,j,y}$ = Project emissions from fossil fuel combustion

Determination of ex-ante estimations of project emissions due to consumption of grid-sourced electricity ($PE_{EC,y}$):

In the context of ex-ante estimations of emission reductions, it is assumed that 100% of all electricity consumed by CPA-1 Santa Rosa is sourced by the National Electricity Grid of Brazil.

Project emissions from consumption of grid-sourced electricity ($PE_{EC,y}$) are calculated following the applicable guidance of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) as follows:

$PE_{EC,grid,y} = EC_{PJ,grid,y} * EF_{EL,grid,PJ,y} * (1+ TDL_{grid,y})$

Where:

$EC_{PJ,grid,y}$ = Quantity of grid-sourced electricity consumed by CPA-1 Santa Rosa during the year y (in MWh). For the particular case of determination of project emissions associated

with consumption of grid-sourced electricity by CPA-1 Santa Rosa (under its original design configuration), $EC_{PJ,grid,y}$ is estimated to be 540 MWh per year.

$EF_{EL,grid,PJ,y}$ = Emission factor for grid sourced electricity in year *y* (in tCO_2/MWh). The 1.3 tCO_2/MWh default value is ex-ante selected as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) as the applicable value for electricity generated by CPA-1 Santa Rosa and exported through the electricity grid to which the CPA is connected to. Further details for the value determination for $EF_{EL,grid,PJ,y}$ are presented in Sections B.4.2.

$TDL_{grid,y}$ = Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by CPA-1 Santa Rosa in year *y*. For the particular case of determination of project emissions associated with consumption of grid-sourced electricity by CPA-1 Santa Rosa, $TDL_{grid,y}$ is assumed as being 20% ($TDL_{grid,import}$), which is the applicable default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0). Further details for the value determination are presented in Sections B.4.1 and B.5.1.

Determination of ex-ante estimations of project emissions due to consumption of LPG by the CPA-1 Santa Rosa ($PE_{LPG,y}$):

In the particular context of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa within its 2nd 7-year crediting period, consumption of LFG is estimated on 0 kg or 0 m^3 per year (null consumption). $FC_{LPG,y}$ is thus estimated to be 0 ton or 0 m^3 of LPG per year. This assumption is made by taking into account the very low reported and verified LPG consumption figures as part of the latest periodic verifications for CPA-1 Santa Rosa within the currently expired 1st crediting period and by also taking into account operational aspects of the currently installed LFG flaring infrastructure for CPA-1 Santa Rosa. The annual consumption of LPG by the project activity is thus regarded as negligible in the particular context of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa within its 2nd 7-year crediting period[42].

Leakage

No leakage effects need to be accounted under this methodology.

[42] If expected consumption of LPG by CPA-1 Santa Rosa is accounted, it would result in less than 1 tCO_2 over the ex-ante estimates of project emissions for the CPA per year (negligible value). Thus, null (zero) consumption is directly assumed. It is anyhow relevant to note that consumption of LPG by CPA-1 Santa Rosa will be monitored and accounted for the determination of project emissions as part of ex-post determination of emission reductions to be achieved by the CPA within its 2nd 7-year crediting period regardless of the representativeness or materiality of such emissions.

B.4.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2019	241,833	203		241,629
2020	1,044,395	843	0	1,043,552
2021	1,090,455	843	0	1,089,612
2022	1,124,753	843	0	1,123,910
2023	1,165,482	843	0	1,164,639
2024	1,195,647	843	0	1,194,803
2025	1,224,347	843	0	1,223,504
2026	950,029	640	0	949,389
Total	**8,036,941**	**5,903**	0	**8,031,037**
Total number of crediting years	7			
Annual average over the crediting period	1,148,134	843	0	1,147,291

Note: Values of applicable for years 2019 and 2026 are valid for the fractions of these years which are encompassed by the 2nd 7-year crediting period of CPA-1 Santa Rosa: from 05/10/2019 to 31/12/2019 and from 01/01/2026 to 04/10/2026 respectively.

B.5. Monitoring plan

B.5.1. Data and parameters to be monitored

Data / Parameter	Management of SWDS
Data unit	Dimensionless
Description	Management of the SWDS
Source of data	Monitoring will be performed on the basis of one of the following sources: a) Original design of the CTR Santa Rosa landfill; b) Technical specifications for the management of the CTR Santa Rosa landfill; c) Local or national regulations
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Original construction and operational design of the CTR Santa Rosa landfill should be confirmed as not being modified. This is to ensure that no practice aiming to increase methane generation in the landfill has been occurring after the implementation of the CPA. As required by ACM0001 (version 19.0), any change in the management of the CTR Santa Rosa landfill after the implementation of the CPA should be justified by referring to technical or regulatory specifications.
Monitoring frequency	Annually.
QA/QC procedures	Not applicable.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	-

Data / Parameter	$V_{t,wb,j}$
Data unit	m^3 wet gas/h
Description	Volumetric flow of LFG stream in time interval *t* on a wet basis for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa by applying appropriate LFG flow meter(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Volumetric flow measurement of collected LFG should always refer to the actual LFG absolute pressure and LFG temperature. Use of measuring instrument(s)/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported.
QA/QC procedures	Periodic calibration events for the LFG flow meter(s) will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	This parameter will be monitored in case Options B or C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and/or $F_{CH4,NG,y}$.

Data / Parameter	$V_{t,db,j}$
Data unit	m^3 dry gas/h
Description	Volumetric flow of LFG stream in time interval *t* on a dry basis for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of the CPA by applying appropriate LFG flow meter(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Volumetric flow measurement of collected LFG should always refer to the actual LFG absolute pressure and LFG temperature. Calculated based on the wet basis LFG flow measurement plus water concentration measurement. Use of measuring instrument(s)/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported.
QA/QC procedures	Periodic calibration events for the LFG flow meter(s) will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	This parameter will be monitored in case Option A of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and/or $F_{CH4,NG,y}$.

Data / Parameter	$v_{CH4,t,db,j}$
Data unit	m^3CH_4/m^3 dry gas
Description	Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a dry basis for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa by applying an appropriate continuous CH_4 content gas analyzer(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Measurements to be performed by appropriate continuous gas analyzer(s) operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. Use of measuring instrument(s)/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported.
QA/QC procedures	Periodic calibration events in the continuous CH_4 content gas analyzer(s) will be performed by utilization of calibration span gas with certified CH_4 content (for span checking/adjustment). Utilization of an inert calibration gas (e.g. N_2) will also occur (for span checking/adjustment). All calibration gases (span gases) must have a certificate provided by the gas supplier and must be under their validity period. Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.

Additional comment	This parameter will be monitored in case Option B of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and/or $F_{CH4,NG,y}$. This parameter may be monitored in case Options A or D of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) are applied instead.

Data / Parameter	$v_{CH4,t,wb,j}$
Data unit	m^3 CH_4/m^3 wet gas
Description	Volumetric fraction of CH_4 in the collected LFG in time interval *t* on a wet basis for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa by applying appropriate continuous CH_4 content gas analyzer(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Measurements to be continuously performed by appropriate gas analyzer(s) operating in wet-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. (calculated based on the dry basis analysis plus water concentration measurement or continuous in-situ analyzers). Use of measuring instrument(s)/equipment with recordable electronic signal (analogical or digital) is assumed.
Monitoring frequency	Continuous measurements will be recorded and reported.

QA/QC procedures	Periodic calibration events in the continuous CH_4 content gas analyzer(s) will be performed by utilization of calibration span gas with certified CH_4 content (for span checking/adjustment). Utilization of an inert calibration gas (e.g. N_2) will also occur (for span checking/adjustment). All calibration gases (span gases) must have a certificate provided by the gas supplier and must be under their validity period. Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	This parameter will be monitored in case Option C of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and/or $F_{CH4,NG,y}$. This parameter may be monitored in case Options A or D of the methodological tool is applied instead.

Data / Parameter	$\mathbf{M_{t,db,j}}$
Data unit	kg/h
Description	Mass flow of the LFG stream in time interval *t* on dry basis for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of the CPA-1 Santa Rosa by applying appropriate LFG flow meter(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Continuous measurements to be performed by applying appropriate flow meter(s) operating in dry-basis. Calculated based on the wet basis flow measurement plus water concentration measurement. Use of measuring instrument(s)/equipment with recordable electronic signal (analogical or digital) is assumed.

Monitoring frequency	Continuous measurements will be recorded and reported.
QA/QC procedures	Periodic calibration events for the LFG flow meter(s) will be performed by using a reference primary device provided by a third party independent accredited calibration laboratory. Calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	This parameter will be monitored in case Option D of the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) is applied for the determination of $F_{CH4,flared,y}$, $F_{CH4,EL,y}$ and/or $F_{CH4,NG,y}$.

Data / Parameter	**$T_{t,j}$**
Data unit	K[43]
Description	Temperature of the LFG stream in time interval *t* for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa by applying appropriate LFG temperature sensor(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Continuous measurements to be performed by applying appropriate temperature sensor(s).
Monitoring frequency	Continuous measurements will be recorded and reported.

[43] Measurements for $T_{t,j}$ may be recorded and reported in °C. Recorded/reported data will be converted to Kelvin in order to also being recorded/reported in K.

QA/QC procedures	Periodic calibration events will be performed in the LFG temperature sensor(s) by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	In case of measurements for the applicable LFG flow parameter(s) are automatically converted and recorded in normalized cubic meters (by considering standard temperature and pressure (STP) conditions), monitoring of this parameter may not be required.

Data / Parameter	**$P_{t,j}$**
Data unit	Pa[44]
Description	Pressure of the LFG stream in time interval *t* for process *j* (where *j* is the LFG delivery pipeline to the flare(s), and the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa by applying appropriate LFG pressure sensor(s).
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Continuous measurements to be performed by applying appropriate pressure sensor(s).
Monitoring frequency	Continuous measurements will be recorded and reported with an every-minute frequency.

[44] Depending on installed measurement instrument(s), measurements for $P_{t,j}$ may be recorded and reported in mbar. Recorded/reported data will be converted into Pascal in order to be also recorded and reported in Pa.

QA/QC procedures	Periodic calibration events will be performed in the LFG pressure sensor(s) by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards/requirements and/or best practice. Spare instrument(s) may be kept.
Purpose of data	Data will be used for the determination of baseline emissions
Additional comment	-

Data / Parameter	**$EG_{PJ,y} = EC_{BL,y}$**
Data unit	MWh
Description	Amount of electricity generated by the CPA using LFG during the year *y*
Source of data	Measured as part of the operation of the CPA by applying appropriate electricity meter(s). The parameter $EC_{BL,y}$ is equivalent to the parameter $EG_{PJ,y}$ as indicated in ACM0001 (version 19.0).
Value(s) applied	Year / Value (in MWh): 2019: 32,750 2020: 135,840 2021: 169,800 2022: 169,800 2023: 203,760 2024: 203,760 2025: 203,760 2026: 154,634 Values for year 2019 and 2026 are applicable for the period from 05/10/2019 to 31/12/2019 and for the period from 01/01/2026 to 04/10/2026 respectively.
Measurement methods and procedures	Authorized electricity meter(s).
Monitoring frequency	Continuous measurements will be aggregated automatically. Accumulated measurement records will be reported at least once a month.
QA/QC procedures	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of project emissions.
Additional comment	If applicable, measurement records will be crosschecked against available grid-sourced electricity commercialization receipts/invoices.

Data / Parameter	$EC_{PJ,grid,y}$
Data unit	MWh
Description	Amount of grid electricity consumed by the CPA during the year *y*
Source of data	Measured as part of the operation of the CPA by applying appropriate electricity meter(s).
Value(s) applied	It is estimated that CPA-1 Santa Rosa (under its original design configuration) will consume 541 MWh of grid-sourced electricity per year during its 2nd 7-year crediting period.
Measurement methods and procedures	Authorized electricity meter(s).
Monitoring frequency	Continuous measurements will be aggregated automatically. Accumulated measurement records will be reported at least once a month.
QA/QC procedures	Periodic calibration events will be performed in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice.
Purpose of data	Data will be used for the determination of project emissions.
Additional comment	If applicable, measurement records will be crosschecked against available grid-sourced electricity purchasing receipts/invoices.

Data / Parameter	$Op_{j,h}$
Data unit	-
Description	Operation of the equipment *j* that consumes LFG (where *j* is the LFG delivery pipeline to each item/element of the CPA's electricity generation infrastructure and LFG delivery pipeline of the infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network))
Source of data	Measured as part of the operation of CPA-1 Santa Rosa.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.

Measurement methods and procedures	For each equipment unit *j* promoting utilization and/or supply of LFG to consumer(s), it is to be monitored whether the plant/equipment/infrastructure is operating in hour *h* by the monitoring any one or more of the following three parameters: (a) Temperature. Determine the location for temperature measurements and minimum operational temperature based on manufacturer's specifications of the burning equipment. (b) Flame. Flame detection system is used to ensure that the equipment is in operation; (c) Products generated. Monitor the generation of steam for the case of boilers and air-heaters and glass for the case of glass melting furnances. This option is not applicable to brick kilns. $O_{pj,h}$ = 0 when: (a) One of more temperature measurements are missing or below the minimum threshold in hour *h* (instantaneous measurements are made at least every minute); (b) Flame is not detected continuously in hour *h* (instantaneous measurements are made at least every minute); (c) No products are generated in the hour *h.* Otherwise, $O_{pj,h}$ = 1
Monitoring frequency	Hourly
QA/QC procedures	-
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	In the particular case of CPA-1 Santa Rosa the equipment that consume LFG within the project boundary are the engine-generator set(s) of the CPA's electricity generation infrastructure and the infrastructure used to supply of upgraded LFG to consumer(s) through natural gas distribution network.

Data / Parameter	$p_{H20,t,Sat}$
Data unit	Pa
Description	Saturation pressure of H_2O at temperature $T_{t,j}$ in time interval *t*
Source of data	Data as per the literature "*Fundamentals of Classical Thermodynamics*"; Authors: Gordon J. Van Wylen, Richard E. Sonntag and Borgnakke; 4º Edition 1994. Published by John Wiley & Sons, Inc. (normative reference for the methodological tool "Tool to determine the mass flow of greenhouse gas in a gaseous stream" (version 03.0))
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.

Measurement methods and procedures	This parameter is solely a function of the LFG stream temperature $T_{t,j}$ and can be found at above-referenced literature for a total pressure equal to 101,325 Pa.
Monitoring frequency	-
QA/QC procedures	-
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	-

Data / Parameter	**$T_{EG,m}$**
Data unit	ºC
Description	Temperature in the exhaust gas of the enclosed flare in minute *m*
Source of data	Measurements performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Measure the temperature of the exhaust gas of the installed high temperature enclosed flare(s) by appropriate temperature measurement equipment (e.g. thermocouple(s)). Measurements outside the operational temperature specified/recommended by the manufacturer may indicate that the flare is not functioning correctly and may require maintenance. Flare manufacturer must provide suitable monitoring ports for the monitoring of the temperature of the exhaust gas of the flare. These would normally be expected to be in the middle third of the flare. Where more than one measurement port for temperature of the exhaust gas of the flare is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer's specifications for temperature.
Monitoring frequency	Continuous measurements will be recorded and reported.

QA/QC procedures	Temperature measurement equipment should be replaced or calibrated in accordance with their maintenance schedule.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. As part of the monitoring procedure, these events will be noted in the site records along with any corrective action that was implemented to correct the issue. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met. Periodic calibration events will be performed in the instruments by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s) will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.

Data / Parameter	**$Flame_m$**
Data unit	Flame status "*on*" or flame status "*off*"
Description	Flame detection of flare in the minute *m*
Source of data	Measurements/monitoring performed for each operation flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer. Whenever, flame is detected in the flare, flame status "*on*" is attributed. Whenever, flame is not detected in the flare, flame status "*off*" is attributed.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Measure using a fixed installation optical flame detector: Ultra Violet detector or Infra-red or both.
Monitoring frequency	Continuous measurements will be recorded and reported.
QA/QC procedures	Instrument(s)/equipment shall be maintained and calibrated in accordance with manufacturer's recommendations.
Purpose of data	Data will be used for the determination of baseline emissions.

Additional comment	Periodic calibration events will be performed in the instrument(s)/equipment by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instrument(s)/equipment will be subject to a regular maintenance and testing regime in accordance to appropriate national / international standards/requirements and/or best practice. Spare instrument(s) may be kept.

Data / Parameter	**$Maintenance_y$**
Data unit	Calendar dates
Description	Maintenance events completed in year *y* for each operational flare (as monitored by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer).
Source of data	Measurements/monitoring performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Record the date when maintenance events in the installed flare(s) are completed in year *y*. Records of maintenance logs must include all aspects of the maintenance including the details of the person(s) undertaking the work, parts replaced, or needing to be replaced, source of replacement parts, serial numbers and calibration certificate(s).
Monitoring frequency	Annual
QA/QC procedures	Monitoring records must be kept in a maintenance log for two years beyond the life of the flare.
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	Records of performed maintenance events are required so that they can be compared to the maintenance schedule to check that maintenance events in the installed flare(s) were completed within the minimum time between maintenance events specified by the flare manufacturer ($SPEC_{flare,y}$).

Data / Parameter:	$v_{i,RG,m}$
Data unit:	-
Description:	Volumetric fraction of component *i* in the residual gas on a dry basis in the minute m where *i* = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_4, N_2
Source of data:	Measurements performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer using continuous gas analyser(s)
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures:	Monitored continuously as per the methodological tool "Project emissions from flaring" (version 03.0). Gas analyser(s) will be used. Gas analyser(s) will: 1) sample and analyze the methane, carbon dioxide and oxygen content of LFG, 2) provide continuous monitoring of the parameter and 3) transfer data to monitoring system for storage of the information
Monitoring frequency:	Continuously. Values to be averaged on a minute basis
QA/QC procedures:	Analysers must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment:	As a simplified approach, the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer may only measure the content CH_4, CO and CO_2 of the residual gas and consider the remaining part as N_2. Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency

Data / Parameter	$M_{RG,m}$
Data unit	kg
Description	Mass flow of the residual gas on a dry basis at reference conditions in the minute *m*

Source of data	Measurements performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer using a continuous mass flow meter(s)
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Instruments with recordable electronic signal (analogical or digital)
Monitoring frequency	Continuous, values to be averaged on a minute basis
QA/QC procedures	Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	Monitoring of this parameter is applicable in case of enclosed flares and continuous monitoring of the flare efficiency and if the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer select to monitor $M_{RG,m}$ directly, instead of calculating. Monitoring of this parameter may also be necessary for confirming that the manufacturer's specifications for flow rate/heat flux are met. In this case the flow rate should be measured in a kg/h basis

Data / Parameter	$v_{O2,EG,m}$
Data unit	-
Description	Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute *m*
Source of data	Measurements performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer using continuous gas analyser(s)

Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Extractive sampling analysers with water and particulates removal devices or in situ analysers for wet basis determination. The point of measurement (sampling point) shall be in the upper section of the flare (80% of total flare height). Sampling shall be conducted with appropriate sampling probes adequate to high temperatures level (e.g. inconel probes).
Monitoring frequency	Continuously. Values to be averaged on a minute basis
QA/QC procedures	Analyser(s) must be periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency

Data / Parameter	**$fc_{CH4,EG,m}$**
Data unit	mg/m^3
Description	Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m*
Source of data	Measurements performed for each operational flare by the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer using continuous gas analyser(s)
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.

Measurement methods and procedures	Extractive sampling analyser(s) with water and particulates removal device(s) or in situ analyser(s) for wet basis determination. The point of measurement (sampling point) shall be in the upper section of the flare in order that the sampling is of the gas after consumption has taken place (80% of total flare height). Sampling shall be conducted with appropriate sampling probe(s) adequate to high temperatures level (e.g. inconel probe(s)).
Monitoring frequency	Continuously. Values to be averaged on a minute basis
QA/QC procedures	Analyzer(s) must be periodically calibrated according to manufacturer's recommendation. A zero check and a typical value check should be performed by comparison with a standard gas
Purpose of data	Data will be used for the determination of baseline emissions.
Additional comment	Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency. Measurement instruments may read ppmv or % values. To convert from ppmv to mg/m3 simply multiply by 0.716. 1% equals 10,000 ppmv

Data/Parameter	**$TDL_{grid,y}$**
Data unit	-
Description	Average technical transmission and distribution losses for providing electricity to the grid and/or for grid sourced electricity consumed by CPA-1 Santa Rosa in year *y*
Source of data	Use of recent, accurate and reliable data available within the host country or selection of applicable default value for applicable case under Scenario A as per as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) or use annual average value based on recent, accurate and reliable data available within the host country.
Value(s) applied	3% (for generated electricity exported by CPA-1 Santa Rosa through the electricity grid the CPA is connected to ($TDL_{grid,export}$)) 20% (for electricity imported by CPA-1 Santa Rosa through the electricity grid the CPA is connected to ($TDL_{grid,import}$))
Measurement methods and procedures	Value should be estimated for the distribution and transmission networks of the electricity grid of the same voltage as the connection where CPA-1 Santa Rosa is connected to. The technical distribution losses in the grid should not contain other types of grid losses (e.g. commercial losses/theft). The distribution losses can either be calculated or be based on references from utilities, network operators or other official documentation. As an alternative, applicable default values for applicable case under Scenario A as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) may be considered.
Monitoring frequency	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years.
QA/QC procedures	-

Purpose of data	Data is used for determination of baseline and project emissions (due to the net-generation of electricity using LFG and its export to the grid and/or consumption of grid-sourced electricity CPA-1 Santa Rosa respectively).
Additional comment	The methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) defines, as alternative, default value of 20% for project consumption sources (applicable for determination of project emissions due to consumption of grid-sourced electricity by CPA-1 Santa Rosa) and default value of 3% for baseline electricity consumption sources (applicable for the determination of baseline emissions for electricity generation by CPA-1 Santa Rosa). The selection of these default values, in the particular context of ex-ante estimates of emission reductions, is under conformance with applicable guidance of ACM0001 (version 19.0). While transmission and distribution sources applicable for both grid-sourced electricity to be consumed by CPA-1 Santa Rosa and for electricity generation by CPA-1 Santa Rosa (equivalent to electricity consumption of baseline electricity consumption sources when applying the underlying tool) do not fit under Scenario B and/or Scenario C (case II) of the such tool, the selected 20% value for $TDL_{grid,import,y}$ and 3% value for $TDL_{grid,export,y}$ are thus under conformance with applicable guidance of the methodological tool while meeting applicable guidance for Scenarios A and C (cases I and III) of the methodological tool) (with Scenario A being regarded as applicable for the particular case of CPA-1 Santa Rosa (under its original design configuration). It is relevant to note that as per the original CPA design configuration, the amount of electricity to be consumed by CPA-1 Santa Rosa (project electricity consumption sources) to which scenario A of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) refers is smaller than the so-called electricity consumption of baseline electricity consumption sources ($EC_{BL,k,y}$) as per such tool (where $EC_{BL,k,y}$ in the tool is equivalent to the net amount of electricity generated using LFG in year y ($EG_{PJ,y}$) as defined by ACM0001 (version 19.0)). In summary, under its normal operational conditions, CPA-1 Santa Rosa (under its original design configuration) is expected to generate more electricity than it requires for its own operation, with the largest amount of generated electricity being thus exported through the electricity grid it is connected to. Under these particular conditions, also considering the 3% default value for electricity imported by CPA-1 Santa Rosa (through the electricity grid the CPA is connected to) would, in thesis, represent an acceptable alternative. However, as a conservative approach, the generic 20% default value of the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) is selected for project emissions due to the consumption of grid-sourced electricity. This approach results in higher project emissions, thus reducing emission reductions to be achieved by CPA-1 Santa Rosa accordingly.

Data/Parameter	Status of biogas destruction device
Data unit	
Description	Operational status of biogas destruction device(s)
Source of data	Not applicable.
Value(s) applied	No estimated value is required for the determination of ex-ante estimation of emission reduction to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period. Baseline emissions of methane from the SWDS ($BE_{CH4,y}$) are ex-ante estimated by estimating the amount of methane which is destroyed by the CPA through combustion of collected LFG in project's methane destruction devices in year *y* ($F_{CH4,PJ,y} = F_{CH4,flared,y} + F_{CH4,EL,y} + F_{CH4,NG,y}$) as a function of ex-ante estimated values for efficiency of the LFG capture system installed as part of CPA-1 Santa Rosa (η_{PJ}) as well as ex-ante estimations for the amount of methane in the LFG that is generated from the SWDS in the baseline scenario in year *y* ($BE_{CH4,SWDS,y}$) by applying applicable guidance of the methodological tool "Emissions from solid waste disposal sites" (version 08.0) and considering aspects/characteristics of the landfill.
Measurement methods and procedures	Monitoring and documenting may be undertaken through monitoring of the operation of the flare(s) and internal combustion engine-generator sets in order to demonstrate the actual destruction of methane in such installed biogas destruction devices under individual basis. Emission reductions will not accrue for periods in which the underlying destruction device (high temperature enclosed flare or engine-generator set) is not operational.
Monitoring frequency	Continuous measurements will be recorded and reported with a least every minute frequency.
QA/QC procedures	Not applicable.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data/Parameter	$FC_{LPG,y}$
Data unit	ton or m^3
Description	Quantity of LPG consumed by the CPA in year *y*
Source of data	Monitoring based on measurements performed by applying weight scale or volume meter
Value(s) applied	In the particular context of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa within its 2nd 7-year crediting period, consumption of LFG is estimated on 0 kg or 0 m^3 per year. This null value is assumed by taking into consideration the very low reported and verified LPG consumption figures as part of the latest periodic verifications for CPA-1 Santa Rosa within the currently

	expired 1st crediting period and by also taking into account operational aspects of CPA-1 Santa Rosa[45].
Measurement methods and procedures	Recording of measurements of LPG consumed by CPA-1 Santa Rosa in year *y* by using appropriate mass or volume meter (weight scale or flow meter).
Monitoring frequency	Continuous measurements of quantity of LPG by the CPA-1 Santa Rosa will be monitored with frequency not lower than once a month.
QA/QC procedures	LPG purchasing receipts may be used for crosschecking of valid measurement records.
Purpose of data	Calculation of project emissions.
Additional comment	Periodic calibration events will be performed in the mass meters by a third party independent accredited calibration laboratory in a frequency as per instrument specifications and/or instrument manufacturer's recommendations. Instruments will be subject to a regular maintenance and testing regime in accordance to appropriate national/international standards/requirements and/or best practice. Spare instrument(s) may be kept.

Data/Parameter	**$NCV_{LPG,y}$**
Data unit	GJ/ton LPG or GJ/m^3 LPG
Description	Net calorific value of the fuel LPG in year y
Source of data	Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories[46]). For the ex-ante estimation of emission reductions to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period, the value is selected as reported in the Brazilian Energetic Balance Report, year 2019 (Table VIII.9 – Specific Mass and Heating Values – 2018[47])
Value(s) applied	0.1059 (GJ/m^3 LPG)[48]

[45] The annual consumption of LPG by CPA-1 Santa Rosa is regarded as negligible in the particular context of ex-ante estimates of emission reductions to be achieved by the CPA within its 2nd 7-year crediting period (since such emissions potentially result on less than 1 tCO_2 of project emissions per year). Thus, null (zero) consumption of LPG is assumed.

[46] Any future related revision of the IPCC Guidelines will be taken into account.

[47] The Brazilian Energetic Balance Report – 2019 (Relatório Balanço Energético Nacional (BEN) – 2019) is the latest report and it is based on data for year 2018. This official governmental report was published by the entity Empresa de Pesquisa Energética (EPE) and is available online:

http://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-377/topico-470/Relat%C3%B3rio%20S%C3%ADntese%20BEN%202019%20Ano%20Base%202018.pdf

[48] While in the particular context of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa within its 2nd 7-year crediting period, consumption of LFG is estimated on 0 kg or 0 m^3 per year, the assumed value for $NCV_{LPG,y}$ does not affect or influence the determination of ex-ante estimates of emission reductions to be achieved by the CPA within its 2nd 7-year crediting period.

Measurement methods and procedures	-
Monitoring frequency	In case values are provided by the fuel supplier in invoices, the applied weighted average annual value will be determined based on provided related information in the context of each individual fuel delivery event. In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied.
QA/QC procedures	Both values provided by the fuel supplier in invoices as well as regional or national default values will be confirmed to be within the uncertainty range of the IPCC default values (as provided in Table 1.2, Vol. 2 of the 2006 IPCC Guidelines). If the considered values fall below this range, additional information and/or justification will be collected and will be used to justify the outcome. The laboratory (ies) sourcing related measurements or analysis will be confirmed to have ISO17025 accreditation (or it will be justified that it/they can comply with similar quality standards).
Purpose of data	Calculation of project emissions.
Additional comment	If the LPG supplier does provide related NCV values and CO_2 emission factor for the delivered fuel on the invoice and these two values are based on measurements for this specific fuel, this source will be used for the determination of values for the monitoring parameter $NCV_{LPG,y}$. In case, another source(s) for the values is/are applied, regional or national default values or IPCC default values will thus be considered.

Data/Parameter	**$EF_{CO2,LPG,y}$**
Data unit	tCO_2/GJ
Description	CO_2 emission factor of fuel LPG in year *y*
Source of data	Value provided by the fuel supplier in invoices, regional or national default values or IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories)[49]. Appropriate net calorific value (NCV) for LPG may be used for converting energy basis data into mass basis data. For the ex-ante estimation of emission reductions to be achieved by CPA-1 Santa Rosa during its 2nd 7-year crediting period, the value is selected as per 2006 IPCC Guidelines on National GHG Inventories (applicable value at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy)).
Value(s) applied	0.0656[50]
Measurement methods and procedures	-

[49] Any future revision of the IPCC Guidelines will be taken into account.

[50] While in the particular context of ex-ante estimates of emission reductions to be achieved by CPA-1 Santa Rosa within its 2nd 7-year crediting period, consumption of LFG is estimated on 0 kg or 0 m^3 per year, the assumed value for $EF_{CO2,LPG,y}$ does not affect or influence the determination of ex-ante estimates of emission reductions to be achieved by the CPA within its 2nd 7-year crediting period.

Monitoring frequency	In case values are provided by the fuel supplier in invoices, the applied weighted average annual value will be determined based on provided related information in the context of each individual fuel delivery event. In case regional or national default values or IPCC default values are considered an every year monitoring frequency is applied.
QA/QC procedures	Both values provided by the fuel supplier in invoices as well as regional or national default values will be confirmed to be within the uncertainty range of the IPCC default values (as per 2006 IPCC Guidelines on National GHG Inventories - applicable value at upper limit of uncertainty at 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy).). If the considered values fall below this range, additional information and/or justification will be collected and will be used to justify the outcome.
Purpose of data	Calculation of project emissions.
Additional comment	If the LPG supplier does provide related NCV values and CO_2 emission factor for the delivered fuel on the invoice and these two values are based on measurements for this specific fuel, this source will be used for the determination of values for the monitoring parameter $NCV_{LPG,y.}$. In case, another source(s) for the values is/are applied, regional or national default values or IPCC default values will thus be considered.

B.5.2. Sampling plan

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Not applicable.

B.5.3. Other elements of monitoring plan

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General monitoring:
The following instruments/equipment will be used to monitor required data along the operation of CPA-1 Santa Rosa (depending on the applied measurement options and calculation approaches - to be chosen ex-post)[51]:

Instrument or Source of data	Measurement option		Data monitored	
Appropriate volumetric or mass flow meter(s) (one individual LFG flow meter for each high temperature enclosed flare and for each engine-generator sets of the CPA's electricity generation infrastructure and/or for delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network) with separated measurement data being recorded and reported)	A	Volume flow – dry basis; Volumetric fraction dry or wet basis	$\mathbf{V_{t,db,j}}$	Volumetric flow of LFG stream *j* in time interval *t* on a dry basis (in m^3 dry gas/h). *j* = LFG delivery pipeline to each high temperature enclosed flare and/or LFG delivery pipeline each engine-generator set of the CPA's electricity generation infrastructure and/or LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network).
	B	Volume flow – wet basis; Volumetric fraction dry basis	$\mathbf{V_{t,wb,j}}$	Volumetric flow of LFG stream *j* in time interval *t* on a wet basis (in m^3 dry gas/h). *j* = LFG delivery pipeline to each high temperature enclosed flare and/or LFG delivery pipeline each engine-generator set of the CPA's electricity generation infrastructure and/or LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network).
	C	Volume flow – wet basis; Volumetric fraction wet basis	$\mathbf{V_{t,wb,j}}$	Volumetric flow of LFG stream *j* in time interval *t* on a wet basis (in m^3 wet gas/h). *j* = LFG delivery pipeline to each high temperature enclosed flare and/or LFG

[51] Measurement options defined in the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) when referring to "*Adequate volumetric or mass flow meter(s)*" and defined in the methodological tool "Project emissions from flaring" (version 03.0) in other cases. Different measurement options are indeed defined in the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) when referring to "*Adequate volumetric or mass flow meter(s)*". The applicable guidance of the methodological tool "Project emissions from flaring" (version 03.0) also refers to different measurement and calculation options.

Instrument or Source of data	Measurement option		Data monitored	
				delivery pipeline each engine-generator set of the CPA's electricity generation infrastructure and/or LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network).
	D	Mass flow – dry basis; Volumetric fraction dry or wet basis	$M_{t,db,j}$	Mass flow of LFG stream *j* in time interval *t* on a dry basis (in kg/h). *j* = LFG delivery pipeline to each high temperature enclosed flare and/or LFG delivery pipeline each engine-generator set of the CPA's electricity generation infrastructure and/or LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network).
Continuous CH_4 content gas analyser unit(s)	-		$v_{CH4,t,db/wb,j}$	Volumetric fraction of methane on the LFG stream(s) directed to the flare(s) and/or to the engine-generator sets of the CPA's electricity generation infrastructure and to the LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network) in a time interval *t* on a dry or wet basis (in m^3 CH_4/m^3 dry or wet gas)
LFG pressure sensor(s)	-		$P_{t,j}$	Pressure of the LFG stream(s) directed to the flare(s) and/or LFG stream(s) to the engine-generator sets of the CPA's electricity generation infrastructure and/or LFG stream(s) to the LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network) in a time interval *t* (in Pa or mbar) Note: $P_{t,j}$ may not be monitored when using LFG flow meter(s) that automatically consider and measures LFG temperature and LFG pressure, thus expressing LFG volumetric or mass flows in normalised units.
LFG temperature sensor(s)	-		$T_{t,j}$	Temperature of the LFG stream(s) directed to the flare(s) and/or LFG stream(s) to the engine-generator sets of the CPA's electricity generation infrastructure and/or LFG stream(s) to the LFG delivery pipeline for the supply of upgraded LFG to consumer(s) (through natural gas distribution network) in a time interval *t* (in K or ºC)

Instrument or Source of data	Measurement option	Data monitored	
			Note: $T_{t,j}$ may not be monitored when using LFG flow meter(s) that automatically consider and measures LFG temperature and LFG pressure, thus expressing LFG volumetric or mass flows in normalised units.
Not based on measurements. Monitoring performed in the context of operation/monitoring for CPA-1 Santa Rosa (based on calculations)	-	$p_{H20,t,Sat}$	Saturation pressure of H_2O at temperature $T_{t,j}$ in time interval *t* This parameter is solely a function of the LFG stream temperature $T_{t,j}$ and can be found at referenced literature.
Electricity meter(s)	-	$EC_{PJ,grid,y}$	Amount of grid electricity consumed by CPA-1 Santa Rosa in year y (in MWh)
		$EC_{BL,y} = EG_{PJ,y}$	Amount of electricity generated using LFG by CPA-1 Santa Rosa in year *y* (in MWh)
Not based on measurements	**Calculated or application of default values**	$TDL_{grid,y}$	Use of recent, accurate and reliable data available within the host country or selection of the applicable default value as per the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0).
Not based on measurements. Monitoring performed in the context of operation/monitoring for CPA-1 Santa Rosa (based on calculations)	-	**Management of SWDS**	Management of SWDS The design and operational conditions of the CTR Santa Rosa landfill will be annually monitored on the basis of different sources, including *inter alia*: - Original design of the landfill; - Technical specifications for the management of the landfill; - Applicable local or national regulations
Meter or equipment electronics.	-	$Op_{j,h}$	Operation of the equipment that consumes LFG (each engine-generator set of the CPA's electricity generation infrastructure and LFG delivery pipeline for the infrastructure used for the supply of upgraded LFG to consumer(s) (through natural gas distribution network)).
Appropriate Gas analyzer(s) (one individual gas analyzer for each	**Option B.2**	$v_{i,RG,m}$	Volumetric fraction of component *i* in the residual gas on a dry basis in the minute m where *i* = CH_4, CO, CO_2, O_2, H_2, H_2S, NH_4, N_2

Instrument or Source of data	Measurement option	Data monitored	
high temperature enclosed flare)			(As a simplified approach, the coordinating/managing entity (CME) for the Caixa's PoA and/or CPA implementer may only measure the content CH_4, CO and CO_2 of the residual gas and consider the remaining part as N_2) Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency
Appropriate volumetric or mass flow meter(s) (one individual LFG flow meter for each high temperature enclosed flare)	**Option B.2**	$M_{RG,m}$	Mass flow of the residual gas on a dry basis at reference conditions in the minute *m* Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency
Appropriate Gas analyzer(s) (one individual gas analyzer for each high temperature enclosed flare)	**Option B.2**	$v_{O2,EG,m}$	Volumetric fraction of O_2 in the exhaust gas on a dry basis at reference conditions in the minute *m* Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency.
		$fc_{CH4,EG,m}$	Concentration of methane in the exhaust gas of the flare on a dry basis at reference conditions in the minute *m* Monitoring of this parameter is only applicable in case of enclosed flares and continuous monitoring of the flare efficiency
Thermocouple(s)	**A or B.2**	$T_{EG,m}$	Temperature in the exhaust gas of the enclosed flare in minute *m* (ºC) For each one of the installed high temperature enclosed flare(s), it will be continuously measured the temperature of the exhaust gas of the flare through use of appropriate temperature measurement instrument (e.g. thermocouple(s)). Measurements outside the operational temperature specified by the flare manufacturer may indicate that the flare is not functioning correctly and may require maintenance or repair work. For each flare, the temperature of the exhaust gas has to be measured in a suitable monitoring port. In high temperature enclosed flares, monitoring ports are normally expected to be

Instrument or Source of data	Measurement option	Data monitored	
			located within the middle third of the flare. In case more than one temperature port is fit to the high temperature enclosed flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer's specifications for temperature of exhaust gas. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met.
Optical flame detector (using ultra violet (UV) or infra-red technology or both	**A or B.1**	**$Flame_m$**	Flame detection of flare in the minute *m* (Flame "*on*" or Flame "*off*"). For each installed high temperature enclosed flare, continuous monitoring of flame detection through use of appropriate installation (e.g. optical flame detector (using ultra violet (UV) or infra-red technology or both).
CME and/or CPA implementer	**B.1**	**$Maintenance_y$**	Maintenance events completed in year *y* for each operational flare. For each installed high temperature enclosed flare, the date when maintenance events are performed in year *y* are to be recorded. Records of maintenance logs will include all aspects of the maintenance (including the details of the person(s) undertaking the work, parts replaced/repaired, or needing to be replaced, source of replacement parts, serial numbers and related calibration certificates).
CME and/or CPA implementer	**-**	**Status of biogas destruction device**	Operational status of biogas destruction devices The same procedure as adopted for monitoring parameter $Flame_m$. For installed high temperature enclosed flare(s), continuous monitoring of flame detection through use of appropriate installation (e.g. optical flame detector (using ultra violet or infrared technology or both).
Mass/weight scale		**$FC_{LPG,y}$**	Amount of LPG consumed by the CPA in year *y* (in ton)
Not based on measurements Monitoring performed in the	**Calculation approach (option) 1 or 3**	**$NCV_{LPG,y}$**	Net calorific value of the fuel Diesel in year y (in GJ/ton LPG). Data will be determined as per applicable guidance of the methodological tool "Tool to

Instrument or Source of data	Measurement option	Data monitored	
context of operation/monitoring for CPA-1 Santa Rosa (based on calculations)			calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 03.0).
Not based on measurements Monitoring performed in the context of operation/monitoring for CPA-1 Santa Rosa (based on calculations)		$EF_{CO2,LPG,y}$	CO_2 emission factor of fuel LPG in year *y* (in tCO_2/GJ). Data will be determined as per applicable guidance of the methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (version 03.0).

As part of the operation of CPA-1 Santa Rosa, all continuously measured LFG destruction/utilization related parameters as well as measurements related to the exhaust gas of the flare(s) (temperature in the exhaust gas of the flare(s) and eventually other parameters related to flare operational conditions will all be recorded electronically via an appropriate data logger / data acquisition system (to be located within the site boundary). The data logger / data acquisition system will have the capability to record all data in a safe and reliable manner (thus ensuring the required data reliability and validity). Data recording and reporting frequency for these parameters will be at least every minute.

Records of electricity consumed and/or, if applicable, generated by CPA-1 Santa Rosa will also be recorded electronically via an appropriate data logger / data control / data acquisition system (to be located within the site boundary). Data from related grid-sourced electricity purchase invoices and/or historical reports (issued by local electricity transmission/commercialization company) will also be used as cross-checking. Moreover, if applicable, records of electricity generated by the backup captive off-grid electricity generator(s) (fuelled by diesel) may also be regularly recorded (depending on the approach applied for the determination of project emissions from consumption of electricity source by such backup electricity generator(s)).

Records related to supply of upgraded LFG to consumer(s) through natural gas distribution network as part of the operation of CPA-1 Santa Rosa will also be recorded electronically via an appropriate data logger / data control / data acquisition system (to be located within the site boundary).

During the 2nd 7-year crediting period of CPA-1 Santa Rosa, records of quantity of LPG eventually consumed by the CPA will be aggregated manually or automatically (depending on the specifications of related measurement instrument to be applied). Accumulated related measurement records will be reported at with an at least every-month frequency. Data from related eventual LPG purchasing receipts or invoices (to be issued by local LPG distribution company) will also be used as cross-checking.

By the use of appropriate software application, recorded monitoring data will be regularly retrieved, aggregated and reported in order to be considered in the context of calculations of emission reduction achieved by CPA-1 Santa Rosa.

Monitoring records available in the data logger/data acquisition system might be regularly retrieved remotely by modem or directly on site. If automatic data logging by the logger / data acquisition system fails, measurement data might be recorded manually (whenever it is possible). If data is not

properly recorded or cannot be retrieved, no emissions reductions will be claimed for the period encompassing such data recording/reporting failure.

All monitoring data will be recorded and backed-up in a central database. As per the applicable monitoring procedure, data records will be summarized into emission reduction calculations prior to each periodic CDM verification. All data recorded by the data logger / data acquisition system will be made available to the Designated Operational Entity(ies) (DOE(s)) responsible for each periodic verification for CPA-1 Santa Rosa. This will ensure that data integrity and reliability for related monitoring data.

As per the monitoring procedure to be adopted by the SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS, access to monitoring data will be restricted and controlled. All monitoring records will be kept archived until at least two years after the last issuance of CER's for CPA-1 Santa Rosa, whichever occurs later.

It will be the responsibility of the appointed monitoring team manager to ensure that all monitoring data is properly measured and recorded as part of operation of CPA-1 Santa Rosa.

Technical specifications for monitoring instruments/equipment (e.g. manufacturer, model, serial numbers, accuracy, etc.) will be detailed in the Monitoring Reports for each periodic verification.

Maintenance and calibration for monitoring instruments/equipment and CPA's equipment/components in general:
All maintenance service and routines will include all preventive and corrective actions necessary for ensuring good functioning of all project related equipment, such as:

- Visual control of the equipment state and real-time check of displayed parameters,
- Cleaning up the equipment and the sensors,
- Lubrication and greasing,
- Replacement or overhauling of defective parts (including regular welding service in the HDPE pipelines and manifolds).

Calibration events in monitoring instruments/equipment will be periodically and appropriately performed as per applicable frequency, procedures and methods established or recommended by instrument/ equipment manufacturer, applicable national/international standards and/or best practice, as available.

General malfunction of equipment: if monitoring instruments/equipment or CPA's equipment/components present failure or malfunction, applicable repair or replacement actions will be carried out. Spare units for some of the monitoring instruments/equipment may be kept on site.

Operational and management structure for the CPA-1 Santa Rosa:
An appropriate operational and management structure will be made available as part of the operation of CPA-1 Santa Rosa.

The CPA's operational and management structure will rely on trained staff (incl. contractors) with responsibilities clearly defined. All collaborators and employees involved with operation of the CP and/or monitoring will be trained internally and/or externally. Training efforts may include *inter alia*:

a) General competence development about LFG generation and collection;
b) Review of equipment operational principles and captors;
c) Maintenance and calibration requirements for project's related equipment;
d) Procedures for monitoring data gathering and handling;
e) Emergency and safety procedures;
f) General competence development about LFG combustion in high temperature enclosed flares
g) General competence development about the utilization of LFG as gaseous fuel for electricity generation

h) General competence development about the supply of upgraded LFG to consumer(s) through natural gas distribution network.

The monitoring plan will be implemented by reflecting the best practice in terms of monitoring efforts for LFG collection and destruction/utilization project-based initiatives under de CDM.

Monitoring of the management of the landfill:
As required by ACM0001 (version 19.0), the design and operational conditions of the CTR Santa Rosa landfill during the duration of the CPA-1 Santa Rosa will be monitored on the basis of different sources, including *inter alia*:

- Original design of the CTR Santa Rosa landfill;
- Technical specifications for the management of the CTR Santa Rosa landfill;
- Applicable local or national regulations

Original operational design of the CTR Santa Rosa landfill should be confirmed not to be modified in order to ensure that no practice to increase methane generation at the landfill have been occurring, when compared to the landfill management and operation condition prior to implementation of CPA-1 Santa Rosa. As required by ACM0001 (version 19.0), any change in the management of the landfill after the implementation of CPA-1 Santa Rosa should be justified by referring to technical or regulatory specifications and impacts of such changes in the determination of baseline emissions should in this case be taken into account appropriately. Such monitoring requirement will be used for the determination/confirmation of baseline emissions and/or confirmation of the CPA's implementation as described in the CPA-DD (in terms of operation and management conditions of the landfill from which LFG is combusted).
Further monitoring details are included under details for parameter "Management of SWDS".

The CME for CPA-1 Santa Rosa will develop an operational plan that defines a standard against which the project performance will be measured in terms of its emission reductions and compliance with all standards and criteria under the Caixa's PoA. Monitoring will be the responsibility of SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A. / CICLUS staff operating the landfill. The monitoring plan has the following purposes:

- Establish and maintain a reliable and accurate monitoring system
- Provide guidance for the participants on the implementation of necessary measurement and record management procedures;
- Provide guidance for properly transmit Monitoring Reports to Caixa Econômica Federal;
- Guidance for meeting or exceeding CDM requirements for verification and certification purposes

The monitoring plan covers:
1) Monitoring team members' duties and routine reminders;
2) Monitoring schedules;
3) QA/QC procedures;
4) Service forms for data reporting;
5) Corrective action and maintenance plans;

The monitoring methodology is based on direct measurement of the amount of LFG captured and destroyed at the flare(s), LFG utilized as fuel for electricity generation (at the CPA's electricity generation infrastructure) and/or amount of LFG that is upgraded and supplied to consumer(s) (through natural gas distribution network) in order to determine the amount of methane effectively destroyed by CPA-1 Santa Rosa. The monitoring plan provides for continuous measurement of the quantity of LFG used and quality of LFG flared/utilized.

LFG flow meter(s) and CH_4 content gas analyzer(s) will be recording continuously the amount of methane flared/utilized as part of the operation of CPA-1 Santa Rosa. These equipment/instruments are very sensitive, so rigid QA/QC procedures for equipment maintenance and calibration will be developed and performed by SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS staff[52], who also will ensure that proper monitoring procedures are performed and monitoring information is sent on a regular basis to the CME Caixa Econômica Federal.

All landfill facilities will have all monitoring devices on-site.

Devices and methods for data collection:

Electricity consumption: Standard electricity meter(s) will be used for monitoring electricity consumption by CPA-1 Santa Rosa.

Electricity generation: Standard electricity meter(s) will be used for monitoring electricity generation by CPA-1 Santa Rosa.

LFG measurements: LFG flow meter(s), gas analyser(s), thermocouple(s), LFG temperature sensor(s) and LFG pressure meter(s) will be used to determine the amount of methane that is flared/used as part of operation of CPA-1 Santa Rosa. Meters shall be subject to regular maintenance, testing and calibration.

Monitored data:

SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS staff has operational and data collection obligations to fulfill, in order to maximize the GHG emissions reductions, ensuring that sufficient information is available to calculate ERs in a transparent and verifiable manner, allowing a fast and successful verification of these ERs.

The CME Caixa Econômica Federal will take responsibility for the collection of monitored data as part of the operation of CPA-1 Santa Rosa, the emission reduction estimates, producing the Monitoring Reports and reporting to the DOE(s). Caixa Econômica Federal will also maintain all necessary data to undertake this PoA monitoring plan, such as a list of all projects under review for inclusion in the PoA and the performing data and parameters for each included CPA.

All data provided by the operators of CPA-1 Santa Rosa will be checked for completeness and quality and placed on a central database owned by the CME Caixa Econômica Federal. All data recording of the monitored data will include paper and electronic versions, backup systems and periodic checking for data entry mistakes. All records will be kept for at least 2 years after the end of the duration of the PoA.

[52] Regular calibration of the monitoring devices will be undertaken by those responsible for the measurements, as per manufacturer specifications. Archiving of calibration report will be done both in hard copies and in soft copies.

SECTION C. Start date, crediting period type and duration

C.1. Start date of CPA

>>
31/12/2011, when the implementation of the gas collection and LFG flaring system began, with the signature of the contract with the supplier of the flare.

C.2. Expected operational lifetime of CPA

>>
21 years 0 months.

C.3. Crediting period of CPA

C.3.1. Type of crediting period

>>
7 years, renewable, with up to two renewable periods.

C.3.2. Start date of crediting period

>>
01/07/2012, when the CPA became operational.

C.3.3. Duration of crediting period

>>
28-year length crediting period (7-year crediting period to be renewed up to 3 times).

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

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As described in the PoA-DD for the Caixa's PoA, the environmental analysis for the implementation and operation of CPA-1 Santa Rosa is undertaken at both PoA and CPA levels. Brazilian national as well as state laws and regulations require that an environmental analysis should be performed for any kind of landfill. So, the analysis is done at the CPA level as most of the impacts are confined to each CPA landfill site.
Overall, by collecting and combusting/utilizing LFG, CPAs of the the Caixa's PoA, such as CPA-1 Santa Rosa, reduce both global and local environmental effects of uncontrolled LFG emissions. The major components of LFG, methane and carbon dioxide, are colourless and odourless. Although the majority of LFG emissions are quickly diluted in the atmosphere, in confined spaces there is a risk of asphyxiation and/or toxic effects if LFG is present in high concentrations. LFG also contains over 150 trace components that can cause other negative local and global environment effects such as odour nuisances, stratospheric ozone layer depletion, and ground level ozone creation. CPAs of the Caixa's PoA, such as CPA-1 Santa Rosa, contribute to reduce LFG risks of toxic effects on the local community and local environment.

None of the CPAs of the Caixa's PoA, such as CPA-1 Santa Rosa, is not expected any negative transboundary impacts in Brazil.

D.2. Environmental impact assessment

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Information about the analysis of the environmental impacts for CPA-1 Santa Rosa and related validation assessment by the DOE are presented in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) + Validation Report for the Caixa's PoA (dated 28/09/2012) for which CPA-1 Santa Rosa represents the 1st included specific CPA.

SECTION E. Local stakeholder consultation

E.1. Modalities for local stakeholder consultation

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Information about previously occurred solicitation of comments from local stakeholders (including received comments) and related validation assessment by the DOE are presented in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) + Validation Report for the Caixa's PoA (dated 28/09/2012) for which CPA-1 Santa Rosa represents the 1st included specific CPA.

E.2. Summary of comments received

>>

Information about solicitation of comments from local stakeholders (including received comments) and related validation assessment by the DOE are presented in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) + Validation Report for the Caixa's PoA (dated 28/09/2012) for which CPA-1 Santa Rosa represents the 1st included specific CPA.

E.3. Consideration of comments received

>>

Information about the previously occurred solicitation and consideration of comments from local stakeholders (including received comments) and related validation assessment by the DOE are presented in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) + Validation Report for the Caixa's PoA (dated 28/09/2012) for which CPA-1 Santa Rosa represents the 1st included specific CPA.

SECTION F. Eligibility for inclusion[53]

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
1	Geographical boundaries of CPAs consistent with the geographical boundary of the PoA.	The solid waste disposal site (SWDS) where the waste is disposed shall be clearly identified and only municipal solid waste (MSW) shall be considered (no hazardous wastes at the project site).	As previously outlined in the CPA-DD valid for its currently expired 1st 7-year crediting period, CPA-1 Santa Rosa is located under the geographical coordinates presented in section A.2 and it is currently implemented and under operation within the geographical limits of the CTR Santa Rosa landfill, of which is a landfill site where only Municipal Solid Waste (MSW) has been disposed (no disposal of hazardous waste has ever occurred at the CTR Santa Rosa landfill).	CPA-1 Santa Rosa (under its original design configuration) was previously included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. The demonstration and assessment of the implementation of CPA-1 Santa Rosa within the geographical limits of the CTR Santa Rosa landfill (a SWDS where only MSW has been historically disposed) was previously made as part of the of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period)[54]. Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

[53] While this CPA-DD is valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa (of which starting and ending dates match with the starting and ending dates of the 1st 7-year crediting period of the Caixa's PoA), information about category, required condition, supporting evidence for inclusion of eligibility criterion of the Caixa's PoA refer to related content included in the PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA.

Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

[54] The CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa includes the following related to eligibility of the CPA to be included in the Caixa's PoA:

"The CPA is eligible to be included in the Caixa PoA because:

- *SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental has confirmed with the letter of intent (LoI) their voluntary participation to the proposed PoA coordinated by Caixa, and that the CTR Santa Rosa is neither registered as an individual CDM project activity nor included as part of another registered PoA.*
- *The CTR Santa Rosa is a Regional sanitary landfill project, receiving municipal solid waste from Rio de Janeiro, Seropédica and Itaguaí municipalities.*
- *The baseline scenario consists of the total or partial release of LFG to the atmosphere;*
- *The project activity intends to collect LFG to be flared, used for energy generation and used to supply consumers through a natural gas distribution network.*
- *The solid waste disposal site where the waste would be dumped can be clearly identified;*
- *Only municipal solid waste will be received at the site as per the technical specifications of the concession; additionally hazardous wastes are not allowed to be disposed at the site, therefore the site is eligible under this PoA,*
- *SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental has agreed to conduct the stakeholder consultation as required by Brazil's DNA, and as outlined in Section C of this document,*
- *SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental will take responsibility for operating and monitoring the CPA-1 CTR Santa Rosa as per the CDM rules and guidelines provided by Caixa;*
- *Additionality analysis is performed at the CPA level, following a financial analysis and demonstrating that the project is not viable unless it is registered as a CDM project;*
- *SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental has confirmation from Caixa, where future carbon revenues have been presented for the loan evaluation and are a partial guarantee to repay the loan.*

The CPA-1 CTR Santa Rosa is additional, meeting the eligibility criteria listed above and justified as follows:

- *There should not be any existing operating LFG collection system – CTR Santa Rosa landfill is still being constructed and there are no plans to implement a LFG collection system without CDM registry.*
- *The costs for installation of the LFG collection and use systems should be prohibitive without CDM revenues. Estimated costs necessary to implement the LFG capture system, flaring system, electricity generators and LFG upgrading and distribution station exceeds R$ 90 million, making this project not viable without CDM revenues. (…)"*

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
2	Conditions to avoid double counting of GHG emission reductions or net anthropogenic GHG removals, such as unique identifications of product and end-user locations (e.g. programme logo).	The CME has established a management system/procedure to avoid double counting as presented in section B of the PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA. Also, a record keeping system for each CPA under the PoA is maintained.	As outlined in Section B of the PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA, the CME Caixa Econômica Federal of the Caixa's PoA has established the operational and management plan which includes the following: a) Letter of Intent and provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA; b) System/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA; c) Eligibility assessment d) Memorandum of agreement, e) Data gathering and documentation; f) CPA-DD preparation g) Inclusion of CPA in the PoA; h) A record keeping system for each CPA under the PoA	CPA-1 Santa Rosa (under its original design configuration) was previously included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. Meeting the requirements and guidelines for the operational and management plan of the Caixa's PoA as previously defined by the CME Caixa Econômica Federal was previously demonstrated and assessed as part of the of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

3	Conditions to confirm that CPAs are neither registered as CDM project activities included in another registered PoAs, nor the project activities that have been deregistered.	The CPA shall not lead to double counting of emission reduction as this CPA and shall not be part of any of the following categories: (1) Standalone CDM project activity; (2) Bundled CDM project activity; (3) Another registered PoA.	Signature of a letter of intent (LoI) from the CPA implementer prior to the start date of the CPA in order to confirm both their voluntary participation to the proposed PoA coordinated by Caixa Econômica Federal, and that the project under the CPA is neither registered as an individual CDM project activity nor included as part of another registered PoA or that have been deregistered].	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. The previously occurred signature of a letter of intent (LoI) from the CPA implementer prior to the start date of CPA-1 Santa Rosa in order to confirm both their voluntary participation to the Caixa's PoA and that CPA-1 Santa Rosa was neither previously registered as an individual CDM project activity nor included as part of another registered PoA or that have been deregistered were all previously demonstrated and assessed as part of the of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).
4	Specification of the technology/measure,	The site hosting the CPA shall be a licensed	The CPA proponent is responsible for	CPA-1 Santa Rosa (under its original design

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
	such as the level and type of service, as well as performance specification based on, inter alia, testing/certification.	Municipal or Regional sanitary landfill located in the host country Brazil. While there are no restrictions in terms of size of the SWDS hosting the CPA neither in terms of the amount of MSW disposed, the management of the SWDS in the CPA shall not be changed in order to increase methane generation when compared to the situation prior to the implementation of the CPA. Furthermore, the SWDS shall receive municipal solid waste only.	operating and monitoring the CPA as per the CDM rules valid for large-scale projects as CPAs and guidelines provided by Caixa Econômica Federal. [Several documents can be used to demonstrate compliance with this eligibility criteria including the following documents, but not limited to: - Environmental license; - Engineering studies; - Monitoring documents; - Other documents, e.g. quality and/or environmental attesting certification.]	configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. The ability and competence of the CPA implementer for operating and monitoring CPA-1 Santa Rosa (under its original design configuration) as per the CDM rules valid for large-scale projects as CPAs and guidelines provided by the CME Caixa Econômica Federal were previously demonstrated and assessed as part of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
5	Conditions to check the start dates of CPAs through documentary evidence.	The identification of the starting date of the proposed CPA shall be according to the CDM Glossary of Terms and is after the starting date of the PoA, i.e. 22/09/2010, when the PoA-DD was first published for global stakeholder consultation (start of the validation process).	The CPA starting date is 01/07/2012 as presented in CPA-DD valid for the currently expired 7-year crediting period of CPA-1 Santa Rosa. This date represents the date when CPA-1 Santa Rosa became on operational status.	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since 01/07/2012. The starting date of CPA-1 Santa Rosa was previously defined as part of the occurred inclusion of the CPA under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

<table>
<tr><th>No.</th><th>Eligibility criterion - Category</th><th>Eligibility criterion - Required condition</th><th>Supporting evidence for inclusion</th><th>Description of this CPA in relation to the criterion and supporting evidence</th></tr>
<tr><td>6</td><td>Conditions to ensure compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents.</td><td>The proposed CPA shall follow all the applicability conditions of ACM0001 as discussed in section I.2 of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA. Also, the CPA shall be according to the baseline scenario identified in ACM0001 and presented in section I.5 of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA. The identification of the baseline scenario is to be performed at an individual/specific CPA level following section I.5 of the PoA-DD. The CPA encompasses one of the following scenario:
<table>
<tr><th>#</th><th>Displ. Of a GHG intensive servic</th><th>LFG release in the baselin</th><th>LFG relea se in the base line</th></tr>
<tr><td>1.1</td><td rowspan="2">No. LFG flared</td><td>Partial</td><td>Yes</td></tr>
<tr><td>1.2</td><td>Total</td><td>Yes</td></tr>
<tr><td>2.1</td><td rowspan="2">Yes, electricity generation</td><td>Partial</td><td>Yes</td></tr>
<tr><td>2.2</td><td>Total</td><td>Yes</td></tr>
<tr><td>3.1</td><td rowspan="2">Yes, supply to consumers</td><td>Partial</td><td>Yes</td></tr>
<tr><td>3.2</td><td>Total</td><td>Yes</td></tr>
<tr><td>4.1</td><td rowspan="2">Yes, electricity gen. + supply to consumers</td><td>Partial</td><td>Yes</td></tr>
<tr><td>4.2</td><td>Total</td><td>Yes</td></tr>
</table></td><td>The baseline scenario for emissions of methane consists of the total release of LFG into the atmosphere, by assuming no amount or no share of methane that would have been captured and destroyed in the absence of the CPA due to regulatory or contractual requirements and/or to address safety and odour concerns, or for other reasons. Regarding the project scenario, LFG is flared and used for electricity generation and/or LFG supply to consumer(s) through natural gas distribution network. Also, the amount of organic waste that would be recycled in the absence of the CPA is not reduced.</td><td>CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012.

Previously defined requirements established in the PoA-DD for the 1st 7-year crediting period of the Caixa's PoA related to the design scenario of CPAs to be included in the PoA were previously systematically met, as part of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period).

As outlined in Section A.2, CPA-1 Santa Rosa (under its original design configuration) fits under Design Scenario 4.2.

Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).</td></tr>
</table>

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
7	Conditions to ensure that CPAs meet the requirements for the demonstration of additionality following the requirements contained in the additionality section of the applied methodology. If investment analysis is used for the demonstration of additionality, the CPA-DD shall include a. input parameters used in the investment analysis together with a description of how the values for these parameters are obtained for each CPA or b. define technical and economic criteria with a range of values for each input parameter.	The proposed CPA shall be a large scale project type and not involve combination of other methodologies than ACM0001. The identification of the baseline scenario and additionality shall be performed at an individual/specific CPA level by following one of the applicable procedures established in section I.5 (of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA).	The identification of the baseline scenario to the proposed CPA is presented in section I.5 (of the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA) and it passes the additionality test as discussed in the same section.	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. Requirements of ACM0001 and applicable methodological tools related to assessment and demonstration of additionality for CPA-1 Santa Rosa were previously met, as part of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
8	Conditions to ensure the compliance with other requirements of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents.	The proposed CPA shall follow ACM0001 and referred tool presented in section I.1, as well as CDM-PS-PoA, CDM-PCP-PoA and CDM-VVS-PoA.	This CPA-DD.	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. Requirements of ACM0001 and CDM regulatory standards and procedures were previously sistematically followed, validated and approved as part of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 1st 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
9	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis.	The local stakeholder consultation and the environmental impact analysis shall be performed at CPA level by following the Host Country requirements. Requirements from the Brazilian DNA shall be considered. Also, the site hosting the CPA must be a licensed Municipal or Regional sanitary landfill located in the host country Brazil.	The project implementer has agreed to follow stakeholder consultation requirements as per Brazil's DNA.	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. Stakeholder consultation requirements, as defined by the DNA of Brazil, were previously met at the time of the previously occurred inclusion of the CPA under the Caixa's PoA (for its currently expired 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
10	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance.	The CPA implementer shall confirm that the proposed CPA does not result in a diversion of Official Development Assistance from an Annex I country. In the case the implementation of the CPA requires a loan, the CPA proponent must have confirmation from the financial institution providing the loan for the CPA, where future carbon revenues have been presented for the loan evaluation and are a partial guarantee to repay the loan. In case of funding from Annex I Parties, demonstration of non-diversion of official development assistance (ODA) is to be provided.	[Financing contract or signed declaration from the CPA implementer can be used as supporting evidence demonstrating that the CPA does not deviate from an ODA]	CPA-1 Santa Rosa (under its original design configuration) was previously successfully included in the Caixa's PoA at the time of the registration of the PoA under the CDM and its has been under operation since year 2012. The occurred implementation and starting of operations of CPA-1 Santa Rosa does not represent deviation of ODA. This was demonstrated as part of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA (for its currently expired 7-year crediting period). Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
11	Target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid), and where applicable, distribution mechanisms (e.g. direct installation).	Not applicable. The CPA shall not involve a target group.	Not applicable.	Not applicable. Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).
12	If the generic CPA applies sampling for the determination of parameter values for calculating GHG emission reductions or net anthropogenic GHG removals, conditions related to sampling requirements for the PoA in accordance with the "Standard: Sampling and surveys for CDM project activities and programme of activities".	Not applicable. The proposed CPA shall not applying sampling. Parameters will be monitored at CPA level under conformance with general requirements and guidance included in I.7 of the PoA-DD valid for the 2nd 7-year crediting period of the Caixa's PoA.	Not applicable.	Not applicable. Details and demonstration on how both CPA-1 Santa Rosa (under its original design configuration) and the CTR Santa Rosa landfill have previously met all previously defined eligibility criteria for its inclusion in the Caixa's PoA are included in the CPA-DD for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) and corresponding Validation Report (dated 28/09/2012).

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion	Description of this CPA in relation to the criterion and supporting evidence
13	If the generic CPA is small-scale or microscale, conditions to ensure that CPAs that will be included meet the small-scale or microscale thresholds and remain within those thresholds throughout the crediting period of the CPAs. However, if the generic CPA consists solely of units that qualify as "microscale CDM units" as defined in the "Methodological tool: Demonstration of additionality of microscale project activities", these conditions are not required.	Not applicable. The Caixa's PoA is a large scale PoA applying the CDM baseline and monitoring methodology ACM0001.	Not applicable.	Not applicable.
14	If the generic CPA is small-scale or microscale, conditions for the debundling check based on the "Methodological tool: Assessment of debundling for smallscale project activities". However, if the generic CPA consists solely of units that qualify as "microscale CDM units", these conditions are not required.	Not applicable. The Caixa's PoA is a large scale PoA applying the CDM baseline and monitoring methodology ACM0001.	Not applicable.	Not applicable.

Appendix 1. Contact information of CPA implementers

Organization name	SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental
Country	Brazil
Address	Rua Sao Jose, 70; 4o andar; Centro Rio de Janeiro – RJ 20010-020
Telephone	+55-21-3575-5700
Fax	+55-21-35755724
E-mail	priscila.zidan@ciclusambiental.com.br
Website	www.ciclusambiental.com.br
Contact person	Ms. Priscila Zidan (Project Manager)

Appendix 2. Affirmation regarding public funding

Not applicable. The implementation and operation of CPA-1 Santa Rosa do not involve any kind of public funding from Parties included in Annex I.

Appendix 3. Further background information on ex ante calculation of emission reductions

All information about the ex-ante calculation of emission reductions are summarized in Section B.4.3. An emission reduction calculation spreadsheet includes all calculations and figures which are indicated in Section B.4.3. This spreadsheet is enclosed to this CPA-DD.

The approved baseline and monitoring methodology ACM0001 (version 19.0) is applied. In addition, following methodological tools (which are referred by this CDM baseline and monitoring methodology or by one of the applied methodological tools and are also listed in Section B.2) are also applied:

- "Emissions from solid waste disposal sites" (version 08.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf)
- "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf)
- "Project emissions from flaring" (version 03.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf)
- "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v3.0.pdf)
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 03) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf)
- "Combined tool to identify the baseline scenario and demonstrate additionality" (version 07.0) (https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v7.0.pdf)

Demonstration applicability conditions for ACM0001 (version 19.0) and for all methodological tools referred in Section B.2 are included in the tables below:

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	**Justification**
"The methodology is applicable under the following conditions: *(a) Install a new LFG capture system in an existing or new (Greenfield) SWDS where no LFG capture system was or would have been installed prior to the implementation of the project activity; or* *(b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that:*	As per the CDM project standard for programme of activities (CDM-PS-PoA), in the context of the renewal of crediting period for a previously included CDM component project activity (CPA), the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa is to be completed by applying the CDM baseline and monitoring methodology applied in the PoA-DD for the PoA for which this particular CPA is part of. CPA-1 Santa Rosa was previously included in the Caixa's PoA by applying the CDM baseline and monitoring methodology ACM0001 (version 11). Later the Caixa's PoA had its 1st renewal of 7-year crediting period processed with the PoA-DD valid for its 2nd crediting period being registered by applying ACM0001 (version

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
(i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and *(ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available;* *(c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:* *(i) Generating electricity;* *(ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or* *(iii) Supplying the LFG to consumers through a natural gas distribution network;* *(iv) Supplying compressed/liquefied LFG to consumers using trucks;* *(v) Supplying the LFG to consumers through a dedicated pipeline;*	19.0) (which was the latest valid version of ACM0001 baseline and monitoring methodology at that time). While version 19.0 currently represents the latest version of ACM0001, ACM0001 (version 19.0) and while the PoA-DD for the 2nd 7-year crediting period of the Caixa's PoA applies it, it is thus selected as the applicable methodology for the 2nd renewal of the crediting period of CPA-1 Santa Rosa. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. In the context of the previously occurred inclusion of CPA-1 Santa Rosa under the Caixa's PoA, as described in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of this particular CPA (CPA-DD version 7.5, dated 11/09/2015), the original design for CPA-1 Santa Rosa encompasses the installation of a new active (forced) LFG capture system in an existing SWDS replacing a previously existent conventional passive LFG venting system (where no combustion of LFG occurred)[55]. The project was implemented in year 2012. In this sense, condition (a) of the quoted applicability criteria is met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. It is important to note that, at the time the design for CPA-1 Santa Rosa was conceived (during time period encompassing years 2011 and 2012) as declared in the latest version of the CPA-DD valid for the 1st 7-year crediting period, there were no pre-project active/forced LFG capture system that has been in operation in the last calendar year prior to the start of the CPA (in year 2012). The CPA design encompasses collection of LFG (which is collected as part of the operation of the CPA [56]) and its destruction through combustion in the installed high temperature enclosed flares. Furthermore, under the original design configuration of CPA-1 Santa Rosa, fraction of collected LFG is also expected to be utilized as gaseous fuel for electricity generation in a set of engine-generator sets of the

[55] The installed active (forced) LFG capture system as part of CPA-1 Santa Rosa encompasses entirely new equipment (centrifugal blowers, flares, etc.). By assuming that the CPA encompasses the installation of a new LFG capture system replacing a previously existent LFG venting system (using conventional passive LFG venting drains with no combustion of LFG occurring), in the particular context of the demonstration of meeting of applicability criteria for ACM0001 (version 19.0), it is assumed that condition (a) is applicable and condition (b – i) is not applicable.

[56] It is important to note that, as further explained ahead besides of the project's LFG collection wells, despite of all improvements made in the project's LFG collection infrastructure, there are still conventional passive LFG venting/combustion drains under operation at the UVS - Caieiras landfill. In areas of the landfill which are not yet covered by the project's LFG collection wells and LFG collection pipeline network, the use of such conventional drains has been a practice. In April/2020, there were about 100 conventional passive LFG venting/combustion drains yet under operation at the landfill. It is always important to take into account the very large area encompassed by the UVS – Caieiras landfill. Such drains are completely independent and not related to the project activity (with no LFG vented or combusted by such drains being accounted in the context of the determination of amount of methane actually destroyed by the project activity).

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
(d) Do not reduce the amount of organic waste that would be recycled in the absence of the project activity."	CPA's electricity generation infrastructure. Moreover, under the original design configuration of CPA-1 Santa Rosa, other fraction of collected LFG is expected to be upgraded and supplied to consumer(s) through natural gas distribution network. Thus, CPA-1 Santa Rosa fully fulfills condition (c-i) and (c-iii). This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. As a result of the previously occurred implementation of CPA-1 Santa Rosa, there were no quantitative, qualitative, procedural or regulatory change occurred in terms of MSW management activities and policies valid for the CTR Santa Rosa landfill or applicable in any other potential waste treatment or disposal facility under the area of influence of this particular landfill site (that would be promoted or triggered by the CPA) in comparison with what would occur in the absence of CPA-1 Santa Rosa (baseline scenario). This situation is expected to remain the same during the 2nd 7-year crediting period of CPA-1 Santa Rosa. It is crucial to note that, mainly by taking into consideration the nature of the CPA and aspects related to recycling of organic fraction of MSW in the region of CTR Santa Rosa landfill and in the rest of Brazil, the implementation and operation of CPA-1 Santa Rosa *per se* are not expected to promote or trigger any quantitative change in waste disposal activities undertaken at the CTR Santa Rosa landfill. Furthermore, no quantitative or qualitative changes in terms of waste management practices are expected to be promoted or triggered in any other existent or potential waste disposal or waste treatment facility (located or to be located in the region of influence of the CTR Santa Rosa landfill) as a direct outcome or consequence of the operation of the CPA during its 2nd 7-year crediting period. Thus, the mere previously occurred implementation of the CPA and its continuous operation during its 2nd 7-year crediting period are not expected to promote or trigger any reduction (or prevention) of the amount of organic type of MSW (or any other type of solid waste) that would eventually be recycled or utilized in the region of influence of the CTR Santa Rosa landfill (e.g. no prevention by the CPA of the implementation or/and non-promotion of any reduction of activity in an existent or hypothetical waste composting facility that would otherwise promote utilization/recycling of waste in the region (for example)). As demonstrated in the applicable construction, design and operational requirements valid for the CTR Santa Rosa landfill (as defined by the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
	and confirmed in the previously issued environmental permits for the construction and the operation of this particular landfill site), the CTR Santa Rosa landfill is not expected to include any activity or initiative promoting recycling or utilization of organic fraction of waste was to be disposed at this landfill (such as implementation of a large scale waste sorting or waste composting facility for example). Without any organic waste recycling activity or initiative being under operation within the limits of the CTR Santa Rosa landfill, it is thus clearly not expected that the implementation and operation of CPA-1 Santa Rosa could *per se* eventually reduce organic waste recycling activities within the limits of the CTR Santa Rosa landfill. It is imperative to note that design, construction and operational aspects for the CTR Santa Rosa landfill were previously defined in accordance with the commercial agreements that the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental currently holds and is expected to hold in the position of operator and owner of the CTR Santa Rosa landfill and as regional waste management company (service provider) providing MSW disposal services for municipalities located within the Metropolitan Region of Rio de Janeiro. Furthermore, it is also crucial to take into account that currently there is not even any existent or planned large-scale MSW sorting, recycling or utilization facility for organic fraction of MSW (e.g. a large-scale waste composting plant) with comparable size/capacity and located in the region of influence of the CTR Santa Rosa landfill. As a matter of fact, recycling and utilization of organic fraction of MSW is not a common practice in the whole country of Brazil. In this sense, the implementation and the operation of CPA-1 Santa Rosa *per se* does not represent any perverse incentive or driver for the promotion of any supposed quantitative or qualitative reduction or prevention of waste recycling related activities (or initiatives for any type of organic fraction of solid waste or solid residues) that would occur in the region of influence of this particular landfill[57] in the absence of

[57] As per the Brazilian Federal Law 12.305/10 passed in year 2010, waste recycling is defined as a process of transformation of waste material and residues through promotion of changes in their physical, chemical or biological properties in order to allow and promote use/utilization of such materials as raw material or even as new products. Although waste recycling is being regarded in the national sector directives for waste management as a priority goal in the whole country, solid waste recycling initiatives in Brazil are still being quite limited (especially in the case of organic fraction of MSW) mainly due to economic restrictions. As outlined in the publication "*Panorama dos Resíduos Sólidos no Brasil – 2018/2019*" (tittle translated into English language as "*Outlook of Solid Waste Sector in Brazil – years 2018/2019"* and available online at: http://abrelpe.org.br/download-panorama-2018-2019/), solid waste recycling initiatives in Brazil have encompassed mainly the following by-products/waste types with higher economic value:

- aluminum (mainly beverage aluminum cans),
- pre-separated/sorted clean (not contaminated) paper,
- pre-separated/sorted (not contaminated) plastic material (mainly PET beverage bottles),
- glass material.

The "*Panorama dos Resíduos Sólidos no Brasil*" is a publication annually or bi-annually published by the Associação Brasileira de Empresas de Limpeza Pública e Resíduos Especiais – ABRELPE (translated into English language as "Brazilian Association for Municipal Solid Waste and Special Waste") and has represented one of the most credible annual outlook and statistics source for the solid waste management in the country. The most recent Greenhouse Gases Emissions National Inventory (published by the Brazilian Ministry of Technology and Science in 2010 and available online at: http://www.mct.gov.br/upd_blob/0213/213909.pdf) also confirms that non-conventional MSW treatment alternatives (such as composting of organic fraction of MSW and waste incineration) are not meaningful practices in Brazil (including the region where the project activity is implemented).
In fact, in year 2012 the Brazilian Ministry of City Infrastructure (through its National Secretary of Sanitation) has published the year 2017 edition of a very comprehensive and detailed sectoral analysis/diagnostic about the whole MSW sector in Brazil: the publication "*Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2017*" (tittle translated into English language as "Diagnostics of Urban Solid Waste Management - 2017" and available online at: http://www.snis.gov.br/diagnostico-residuos-solidos/diagnostico-rs-2017).
Like the Report "*Panorama dos Resíduos Sólidos no Brasil – 2018/2019*", this Government official publication also includes relevant and detailed statistics for MSW management for the main municipalities, States and regions in Brazil. Available statistics includes prevailing practices in terms of waste management practices (collection, disposal and re-use/recycle).
In the particular case of the region under potential influence of the CTR Santa Rosa landfill (cities which are part of the Metropolitan Region of Rio de Janeiro), all solid waste materials (organic or inert) to be eventually/potentially recycled (very small share of collected MSW) are normally previously sorted (under very limited percentiles) in the waste generation sources (prior to be mixed with other types of MSW to be disposed in landfills or waste dump sites in the region). In the particular case of recycling of organic fraction of waste material to be disposed in landfills or dump sites, the current *status quo* is also expected to be the prevailing situation valid in the future: paper waste streams (mixed with other MSW types), food residues, textile, wood waste etc. when ready to be disposed in landfills/dump sites or already disposed in a particular landfills or dump sites) are not even regarded as recyclable material (and thus not even accounted in the available statistics for recyclable material).
Under the category "*organic MSW fraction*" only clean (not contaminated) and previously appropriately sorted pulp/paper/cardboard waste materials have actually been regarded as recyclable material as per both available statistics and available recycling practices. Besides some particular inert waste materials with attractive commercial value (e.g. aluminum packaging material (e.g. cans), some types of clean plastic material and some types of glass), no other waste materials have been under relevant quantities normally collected from stream of MSW to be disposed in landfills in order to be eventually recycled in the region where the project activity is implemented and/or even transported to be recycled in other region. This has also been the typical waste recycling scenario in other regions of Brazil.
Thus, in the particular case of the CTR Santa Rosa landfill, both under the baseline and project scenarios (with or without the implementation of the CPA-1 Santa Rosa), no organic fraction of solid waste stream that has been directed to this particular landfill would be expected to be collected and directed to any type of recycling facility (e.g. composting facility) after or prior its disposal at the landfill site. This situation is expected to remain being the practice in the future.
In fact, as established by related construction and design documents for the CTR Santa Rosa landfill, no waste pickers or waste sorting teams have ever operated in the landfill area. No composting plant for organic waste (or any other type of alternative management for MSW organic content) was ever implemented or is expected to be implemented in the area in the future either.
All of the above-summarized facts and aspects confirms that no relevant sorting and collection of recyclable organic material from MSW already disposed in the CTR Santa Rosa landfill are expected to occur regardless of the implementation of the CPA-1 Santa Rosa (under both baseline and project scenarios). Thus, recycling or alternative use/utilization of organic fraction from waste already disposed in the CTR Santa Rosa landfill are not expected to occur either (regardless of the implementation of CPA-1 Santa Rosa).
In summary, based on information and data included in the "*Diagnóstico do Manejo de Resíduos Sólidos Urbanos – 2017*"; information and data available in the "*Panorama dos Resíduos Sólidos no Brasil – 2018/2019*" and also based on common practice for waste collection, currently existing very limited and not relevant recycling initiatives in the region of CPA-1 Santa Rosa and even in other regions in Brazil, and by also taking into account the particular situation at the region of the project site, the following assertions are valid for potential of recycling of organic fraction of MSW in the region of influence of the CTR Santa Rosa landfill:

- The current MSW management practice in Brazil (and its trend for the future) represents disposal of collected MSW in existing and new landfills (and still existing open dump sites). This practice currently represents almost all undertaken management for all stream of MSW which is actually collected (in mass basis); with very reduced share of collected MSW in Brazil being currently treated under non-conventional methods such as waste incineration (0.03%) and composting (0.11%) (in mass basis as per data of year 2017 (data organized and published in year 2019)).
- It is important to note that in all regions in Brazil with existing MSW disposal activities using landfilling techniques (in existing landfill or existing dump sites) significant quality improvements in terms of MSW disposal services and

techniques are still being required especially for cases where solid waste is disposed in existing not-well-managed landfill or dump sites. Such required improvements include construction of better-designed landfills, use of more appropriated technics for waste compacting and covering, etc. In this particular sense, the CTR Santa Rosa landfill represents a very well designed and very well managed landfill. The main barrier for improving MSW management in Brazil is still being lack of capital and investment capacity from municipalities to face high associated costs for implementing environmentally friendly MSW management operations. Under the region of influence of the CTR Santa Rosa landfill, organic fraction of solid waste material that is collected as MSW has been historically disposed by applying landfilling techniques.

- In all geographical regions in Brazil, relative very low share of previously sorted pulp/paper/cardboard (clean and not contaminated) waste materials have been used as recycling material in the region. Materials under such conditions are termed in the available statistics as "*dry recyclable material*" and are normally not mixed with MSW stream to be sent to landfills or dump sites. It is important to note that the initiatives and businesses involving recycling of previously sorted dry pulp/paper/cardboard materials (clean and not contaminated materials) have their particular dynamics and characteristics and with not so detailed statistics in some cases. However, under no circumstance such activities are to be affected or even influenced by change, improvements or aspects related to MSW disposal activities employing good landfilling technics (for example: in most of the well managed landfills in Brazil, the landfill is implemented in a closed and controlled area without waste pickers collecting waste from the landfill as a way or living). By taking into consideration the dynamics of initiatives promoting recycling of paper material, it is correct to assume that, differently than for MSW disposal activities; policies, planning and practices related to MSW collection and sorting could indeed under a certain limit play a role such initiatives.
- By merely promoting efficient collection and destruction/utilization of LFG in a landfill (where LFG is generated due to anaerobic degradation of organic fraction of MSW which is to be disposed in the landfill under the framework of contracts for MSW disposal signed with municipalities in the region), the implementation of CPA-1 Santa Rosa and its continuous operation *per se* clearly do not represent any driver or incentive for promoting any change in the MSW management situation in the region where it is implemented (including waste recycling practices or initiatives for organic content of MSW to be disposed in landfills or dump sites).

By taking into account (i) the institutional and regulatory framework for the public service of MSW management; (ii) the dynamics of MSW sector in the region where CPA-1 Santa Rosa is implemented and in Brazil, and, by also considering (iii) magnitude of average costs for existing MSW management options (which could be regarded as alternatives to disposal of MSW in landfills (e.g. employment of MSW composting techniques)), (iv) the available related statistics, the following aspects are also to be noted:

- it is clear that promotion or even disincentive of recycling of organic fraction of MSW are not waste policy aspects that would be under any influence or willingness of the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental (as owner and operator of the CTR Santa Rosa landfill). Aspects and actions related to promotion of any increase or even reduction of recycling of organic fraction of waste (and/or recycling of any other type of solid waste material) in the region where CPA-1 Santa Rosa is implemented, are to be seen as dependent in a last instance on public service policies (including policies, laws, regulations and programmes) to be set by competent governmental authorities (under a regional and national level) and by practitioners of recycling. In Brazil, the administrations of municipalities are responsible for addressing all MSW management services. Furthermore, there are federal directives and laws to be considered by Municipalities for the implementation and operation of their local waste management policies. This is the case in the geographical region of the project site. Waste collection and disposal services are normally performed by the municipality and/or are performed by private companies hired and paid by one or more municipalities (under contractual commercial agreements for provision of public service on behalf of such municipality (ies)) for the provision of MSW collection and/or MSW disposal services by completely following directives and requirements established by the municipalities in signed contracts. In this context, both under the baseline and project scenarios (with or without the implementation of CPA-1 Santa Rosa), the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental is clearly not under a position to design or plan the implementation of any initiative promoting recycling or use of organic waste (e.g. operation of a solid waste composting plant) at the CTR Santa Rosa landfill or at other location in the region.
- The implementation and operation of the project-based initiative promoting collection of LFG and its destruction in high temperature flare and utilization as fuel for electricity generation and supply to external consumer(s) at the CTR Santa Rosa landfill *per se* would not trigger any change in the regional policies and practices for MSW management in the region or outside its region of influence either. As further discussed in Sections B.3 and B.4.1, so far, there is still no legal restriction neither requirement for LFG gas collection and its destruction/utilization using high temperature enclosed flares or engine-generator sets or any other device in Brazil. Moreover, there is still no legal restriction neither requirement for passive venting of LFG or its combustion in conventional LFG destruction systems either. There is no applicable regulation/law that deals with LFG management in Brazil. Thus, the implementation (and operation) of more appropriate and environmentally safe management of LFG at the CTR Santa Rosa landfill as part of CPA-1 Santa Rosa clearly does not represent a driver or incentive to promote incremental disposal of organic waste stream at this particular landfill site, thus potentially displacing or preventing such waste stream from being treated under an existent or potential (hypothetical) MSW recycling/utilization facilities (e.g. a hypothetical waste composting plant) instead.

In summary, by taking into consideration the nature of project activity and all facts/aspects and information above-presented, CPA-1 Santa Rosa clearly does not pose any risk or potential to promote any relative decrease of the amount

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
	the CPA at the CTR Santa Rosa landfill. The same is actually also applicable for recycling of inert waste material. Furthermore, regardless of the non-existence of any MSW recycling or utilization facility with comparable capacity that could eventually somehow compete with the CTR Santa Rosa landfill as disposal site for organic fraction of MSW waste, aspects and actions related to promotion of recycling or utilization of organic fraction of solid waste are to be seen as fully dependent on regional and/or national public service policies in the case of Brazil (including policies, laws, regulations and programmes) and such aspects and actions are to be defined/triggered by competent governmental authorities (under a regional and national level) and/or to be eventually implemented/operated by practitioners of waste recycling. In Brazil, the administrations of municipalities typically are the entities responsible for all MSW management services. In this context, waste management companies such as the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental normally acts as service providers, providing MSW collection and disposal services as per directives and contractual requirements set by the municipalities from which generated MSW are to be managed (collected and disposed). In this sense, in the position of a MSW management company operating a LFG collection and destruction initiative in the landfill it operates and owns, the CPA implementer SERB – SANEAMENTO E ENERGIA RENOVÁVEL DO BRASIL S.A./CICLUS Ambiental is clearly not under a position to trigger, establish or promote any reduction or prevention of organic waste recycling in the region where it operates. Finally, the implementation and operation of CPA-1 Santa Rosa has never represented any incentive or driver for involved municipalities, any other public entity or any other relevant recycling practitioner for the promotion of changes in policies and practices related to recycling of inert or organic solid waste in the region of influence of the CTR Santa Rosa landfill (or even beyond such region). No change in this sense is expected to occur during 2nd 7-year crediting period of CPA-1 Santa Rosa either. As outlined in Section B.3 and B.4.1, so far, there are still no legal restrictions or requirements for LFG gas

of organic fraction of MSW that would be otherwise recycled or utilized or prevention of any mean of waste recycling or utilization.

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
	collection and its destruction/utilization using high temperature enclosed flares, engine-generator sets or any other device/equipment in Brazil. Moreover, there are still no legal restrictions neither requirements for venting and/or combustion of LFG in conventional passive LFG destruction systems either (where complete venting and non-combustion of generated LFG through use of conventional passive LFG venting drains is identified as the baseline scenario for the CPA-1 Santa Rosa). Actually, there are no applicable regulations that deal with LFG management in Brazil at all. Thus, the implementation of more appropriate and environmentally safe management of LFG at the CTR Santa Rosa landfill (as a direct outcome of the implementation and operation of CPA-1 Santa Rosa) *per se* does not represent any driver or incentive to dispose incremental amount of MSW in the CTR Santa Rosa landfill (when compared to the situation that would occur in the absence of the CPA) either. In this sense, under no circumstance, CPA-1 Santa Rosa *per se* potentially promotes any displacement of volumes of organic waste stream from treatment/utilization being performed in an existent or hypothetical MSW recycling/utilization facilities (e.g. a MSW composting plant for example) in order to be disposed at the CTR Santa Rosa landfill as a direct result of the implementation and operation of the project activity. Therefore condition (d) is also clearly satisfied. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.
"*The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is* *(a) Atmospheric release of LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and* *(b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln;* *(i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or* *(ii) For heat generation: that heat*	As further demonstrated in Section B.3, the most plausible baseline scenario for methane emissions remains being the release of LFG from the SWDS directly into the atmosphere (with generated LFG being directly vented into the atmosphere through the surface of the landfill and through conventional passive LFG venting drains with no combustion of LFG occurring). The application of the procedure to identify the baseline scenario for CPA-1 Santa Rosa thus falls into (a). This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. While CPA-1 Santa Rosa (under its original design configuration) also encompasses utilization of collected LFG as gaseous fuel for electricity generation (with excess generated electricity being exported through the electricity grid the CPA is connected to), the baseline scenario is demonstrated in Section B.3 as being equivalent amount of electricity being generated by grid-connected existing electricity generation facilities (incl. fossil fuel fired power plants) and addition of new generation sources. The application of the procedure to identify the baseline scenario for CPA-1

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
would be generated using fossil fuels in equipment located within the project boundary." *(c) In the case of LFG supplied to the end-user(s) through natural gas distribution network, trucks or the dedicated pipeline, the baseline scenario is assumed to be displacement of natural gas.* *(d) In the case of LFG from a Greenfield SWDS, the identified baseline scenario is atmospheric release of the LFG or capture of LFG in a managed SWDS and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons.*	Santa Rosa thus also falls into (a). This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. While CPA-1 Santa Rosa (under its original design configuration) also encompasses utilization of collected supply of upgraded LFG to consumer(s) through natural gas distribution network, it is relevant to note that as per the previously conceived original design configuration for CPA-1 Santa Rosa, displacement of natural gas and/or any other fossil fuel) due to the supply of upgraded LFG to consumer(s) (through natural gas distribution network) as part of the operation of the CPA is not regarded as GHG abatement/mitigation measure (and related potential GHG emission reductions are thus not claimable as part of CPA-1 Santa Rosa). The application of the procedure to identify the baseline scenario for CPA-1 Santa Rosa thus does not fall into (c) regardless of the fact LFG is supplied to end-user(s) through natural gas distribution network under the original design configuration of CPA-1 Santa Rosa. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA. While the CTR Santa Rosa landfill does not represent a Greenfield SWDS, (d) is not applicable either. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.
Non applicability conditions	**Justification**
"This methodology is not applicable: *(a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace;* (b) *If the management of the SWDS in the project activity is deliberately changed in order to increase methane generation compared to the situation prior to the implementation of the project*	Neither options (a) and/or (b) occur. Under the original design configuration for CPA-1 Santa Rosa, GHG emission reductions claimed are due to destruction of methane through combustion (in high temperature enclosed flares, engine-generator sets of the CPA's electricity generation infrastructure, and infrastructure of consumer(s) that utilize LFG supplied through the natural gas distribution network) as well as due to generation of electricity by CPA-1 Santa Rosa promoting the use of LFG as renewable energy source for electricity generation. After the implementation of CPA-1 Santa Rosa in year 2012, the landfill operator has continued with MSW disposal activities at the CTR Santa Rosa landfill as per its normal and previously planned/defined operation conditions and practices (as per the practice prior to the implementation of the CPA). MSW disposal practices and management at the CTR Santa Rosa landfill are not expected to change during the 2nd 7-year crediting period of CPA-1 Santa Rosa[58].

[58] The operation of the CTR Santa Rosa landfill in terms of disposal of MSW (practices of waste disposal, covering, levelling, compacting, leachate management, etc.) has not changed after the implementation of CPA-1 Santa Rosa and no change is expected to occur along its 2nd 7-year crediting period either. Thus there is no valid action promoting increase

Applicability Condition of CDM baseline and monitoring methodology ACM0001 – "Flaring or use of landfill gas" (version 19.0)	Justification
activity.	The quoted applicability condition is thus satisfactory met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.

in methane generation (like e.g. through addition of liquids, pre-treating waste, changing the shape of the landfill) that was triggered or promoted by CPA-1 Santa Rosa at the CTR Santa Rosa landfill when compared to the situation prior to the implementation of the CPA.

Regarding the applied methodological tools, the table below summarizes how CPA-1 Santa Rosa meets their applicability conditions:

Methodological tool	Version	Applicability conditions	Comments
"Project emissions from flaring"	03.0	*"This tool provides procedures to calculate project emissions from flaring of a residual gas, where the component with the highest concentration is methane. The source of the residual gas is biogenic (e.g. landfill gas or biogas from wastewater treatment) or coal mine methane.* *(…)* *This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the CDM-PDD the type of flare used in the project activity.* *This tool is applicable to the flaring of flammable greenhouse gases where:* *(a) Methane is the component with the highest concentration in the flammable residual gas; and* *(b) The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).* *The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. For the case of an*	As part of CPA-1 Santa Rosa, share of collected LFG (whose component with the highest concentration is methane) is combusted in high temperature enclosed flares with other shares of collected LFG being combusted in engine-generator sets of the CPA's electricity generation infrastructure and supplied to consumer(s) through natural gas distribution network. ACM0001 requires that, as part of the determination of baseline emissions, project emissions from flaring are to be determined. LFG is a flammable gas generated from the anaerobic decomposition of organic waste material disposed in the CTR Santa Rosa landfill. LFG is thus a gas from a biogenic source. Methane is the component with the highest concentration in LFG[59]. No auxiliary fuel is required to make the flammability of LFG sufficiently enough to be combusted in the CPA's flares[60].

[59] In the particular case of LFG collected and combusted in the enclosed flares as part of the project activity, it has been confirmed that methane is indeed the component of LFG with the highest concentration in the existent LFG analysis reports previously issued by the industrial gas supply company White Martins Gases Industriais Ltda.

[60] In accordance with the design of the currently installed high temperature enclosed flares as part of CPA-1 Santa Rosa, Liquefied Petroleum Gas (LPG) has been used during short time periods for igniting the flares. For starting the flares, LPG is directed to the fuel injectors of the flare and once the flame is sufficiently stable, LFG is directed to the flares and supply of LPG to the injectors is thus interrupted/ceased. The use of LPG by CPA-1 Santa Rosa is also outlined in the latest version of the CPA-DD valid for its 1st 7-year crediting period (CPA-DD version 7.5, dated 11/09/2015). By taking into account the type/purpose of use of LPG by CPA-1 Santa Rosa, it is deemed correct to assume that LPG does not represent any auxiliary fuel (which would be required to make the flammability of LFG sufficiently enough to be combusted in the project flares). It is important to note that during the short time LPG is being combusted during the flare ignition process, no measurements of LFG directed to flares are performed with the flare meeting the operational requirements (as set by equipment manufacturer (e.g. min. flow, min. temperature of exhaust gas of the flare, etc.)). Thus, whenever the minor quantity of LPG is being combusted in any one of the flares of the CPA, no emission reductions due to methane combustion are claimed. It is important to note that as outlined in Section B.4.1, all consumption of LPG by the project activity to ignite the flares are to be accounted as project emissions.

Methodological tool	Version	Applicability conditions	Comments
		enclosed flare, there shall be operating specifications provided by the manufacturer of the flare. *This methodological tool refers to the latest approved version of "TOOL08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream".*	As demonstrated below, the applicability conditions for the methodological tool "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" are sufficiently met. Thus, the quoted applicability conditions defined in the methodological tool are sufficiently met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.
"Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation"	03.0	*"This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity, and procedures to monitor the amount of electricity generated by the project power plant.* *(…)* *If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:* *(a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;* *(b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or*	As established by ACM0001 (version 19.0), generation of electricity by CPA-1 Santa Rosa (which is exported through the grid the CPA is connected to) and consumption of grid-sourced electricity by CPA-1 Santa Rosa are to be accounted for the determination of baseline emission and project emissions respectively. Thus, Scenario A of the methodological tool is applicable. In summary, the quoted applicability criteria defined in the methodological tool are sufficiently met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.

Methodological tool	Version	Applicability conditions	Comments
		(c) *Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid."*	
"Emissions from solid waste disposal sites"	08.0	*"This tool provides procedures to calculate baseline, project or leakage emissions of methane from solid waste disposed or prevented from disposal at a solid waste disposal site (SWDS)."* *"The tool can be used to determine emissions for the following types of applications:* (a) *Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or combusting the methane (e.g. "ACM0001: Flaring or use of landfill gas"). The methane is generated from waste disposed in the past, including prior to the start of the CDM project activity. In these cases, the tool is only applied for an ex ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g. measuring the amount of methane captured from the SWDS);* (b) *Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. An example of this application of the tool is ACM0022, in which municipal solid waste (MSW) is treated with an alternative option, such as composting or anaerobic*	CPA-1 Santa Rosa mitigates methane emissions from a landfill. The applicability of the methodological tool is thus met. Application A in the methodological tool is selected and applied in the context of calculations of ex-ante estimates of emission reductions to be achieved by the CPA during its 2nd 7-year crediting period as established by ACM0001 (version 19.0). Thus, the quoted applicability criteria defined in the methodological tool are sufficiently met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.

Methodological tool	Version	Applicability conditions	Comments
		digestion, and is then prevented from being disposed of in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions.	
"Combined tool to identify the baseline scenario and demonstrate additionality"	07.0	"*This tool is only applicable to methodologies for which the potential alternative scenarios to the proposed project activity available to project participants cannot be implemented in parallel to the proposed project activity"* *(…)* *For example, in the following situations a methodology could refer to this tool:* - *For an energy efficiency CDM project where the identified potential alternative scenarios are: (a) retrofit of an existing equipment, or (b) replacement of the existing equipment by new equipment, or (c) the continued use of the existing equipment without any retrofits;* - *For a CDM project activity related to the destruction of a greenhouse gas in one site where the identified potential alternative scenarios are: (a) installation of a thermal destruction unit, or (b) installation of a catalytic destruction system, or (c) no abatement of the greenhouse gas.* *In these cases, the project proponents could not implement the three alternatives in parallel but they could only implement one of them."* *However, the tool is, for example, not applicable in the following situation: the CDM project activity is the installation of a Greenfield facility that provides a product to a market (i.e. electricity, cement, etc.) where the output could be provided by other existing facilities or new facilities that could be implemented in parallel with the CDM project activity."*	As established by ACM0001 (version 19.0), this methodological tool is applied as per the methodology for the demonstration of the continuation of the baseline scenario. CPA-1 Santa Rosa encompasses destruction of a greenhouse gas in one site where one of the identified potential alternative scenarios is no abatement of the greenhouse gas. The continuation of the baseline scenario is demonstrated by applying the stepwise procedure of ACM0001 (version 19.0) for the determination of the baseline scenario. Baseline emissions are also determined by applying methodological approach also established by ACM0001 (version 19.0) and applicable methodological tools. The applicability condition of the methodological tool is thus met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.

Methodological tool	Version	Applicability conditions	Comments
"Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion"	03.0	This tool provides procedure to determine and calculate project and/or leakage CO_2 emissions from the combustion of fossil fuels. It is used in cases where CO_2 emissions from fossil fuel combustion (for use other than for electricity generation) are calculated based on the quantity of fuel combusted and its properties.	As established by ACM0001 (version 19.0), this methodological tool is applied for the determination of project emissions due to the consumption of fossil fuel by CPA-1 Santa Rosa (with fossil fuel being use for purposes other than for electricity generation). In the particular case of CPA-1 Santa Rosa, Liquefied Petroleum Gas (LPG) has been used to ignite the flares. The applicability condition of the methodological tool is thus met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.
"Tool to determine the mass flow of a greenhouse gas in a gaseous stream"	03.0	"*Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions, which is the case of the present project activity"*	As established by ACM0001 (version 19.0), this methodological tool is applied as per the methodology for determining the mass flow of CH_4 which is sent for combustion in the set of flares and/or in the set of engine-generator sets of the CPA's electricity generation infrastructure and/or supplied to consumer(s) through natural gas distribution network. The applicability condition of the methodological tool is thus met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.
Methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period"	03.0.1	"*This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. The tool consists of two steps. The first step provides an approach to evaluate whether the*	The application of this methodological tool in the context of the renewal of the 7-year crediting period of CPA-1 Santa Rosa is required as per the CDM project standard for programme of activities (CDM-PS-PoA).

Methodological tool	Version	Applicability conditions	Comments
		current baseline is still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period."	The applicability condition of the methodological tool is thus met. This is under conformance with the PoA-DD for the 2nd 7-year crediting period of Caixa's PoA.

Appendix 4. Further background information on monitoring plan

All information about the design and operation of the monitoring plan are presented in Section B.5.1. and B.5.3.

Appendix 5. Summary report of comments received from local stakeholders

Information about solicitation of comments from local stakeholders (including received comments) and related validation assessment by the DOE are presented in the latest version of the CPA-DD valid for the currently expired 1st 7-year crediting period of CPA-1 Santa Rosa (CPA-DD version 7.5, dated 11/09/2015) + Validation Report for the Caixa's PoA (dated 28/09/2012) for which CPA-1 Santa Rosa represents the 1st included specific CPA.

Appendix 6. Summary of post-registration changes

This initial version of the CPA-DD valid for the 2nd 7-year crediting period of CPA-1 Santa Rosa does not encompass post-registration changes.

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Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	20 October 2017	Editorial revision to remove appendix "Applicability of methodologies and standardized baselines" from the main part of the form which had been mistakenly kept in the previous version.
08.0	28 June 2017	Revision to: • Remove appendix "Applicability of methodologies and standardized baselines" as the appendix is not relevant at the CPA level; • Make editorial improvement.

Version	*Date*	*Description*
07.0	7 June 2017	Revision to: • Improve consistency with the “CDM project standard for programmes of activities” and with the PDD and PoA-DD forms; • Make editorial improvement.
06.0	24 May 2017	Revision to: • Ensure consistency with the “Standard: CDM project standard for programme of activities” (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the “Component project activity design document form for small-scale component project activities” (CDM-SSC-CPA-DD-FORM); • Make editorial improvement.
05.0	15 April 2016	Revision to ensure consistency with the “Standard: Applicability of sectoral scopes” (CDM-EB88-A04-STAN) (version 01.0).
04.0	9 March 2015	Revision to: • Include provisions related to statement on erroneous inclusion of a CPA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Provisions related to the Host Party; • Make editorial improvement.
03.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the component project activity design document form for CDM component project activities (these instructions supersede the "Guidelines for completing the component project activity design document form" (Version 01.0)); • Include provisions related to standardized baselines; • Add contact information on a CPA implementer and/or responsible person/ entity for completing the CDM-CPA-DD-FORM in A.13. and Appendix 1; • Add general instructions on post-registration changes in paragraph 4 and 5 of general instructions and Appendix 6; • Change the reference number from F-CDM-CPA-DD to CDM-CPA-DD-FORM; • Make editorial improvement.
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project activity design document form" (EB 66, Annex 16).
01.0	27 July 2007	EB 33, Annex 42 Initial adoption.

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