Gold Standard for the Global Goals

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS 4593
Title of the project (s) covered by monitoring report	Municipal Waste Composting in Dschang, Cameroon
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	GS4593_PDD_CompostingDschang_V5_27 11 2018
Version number of the monitoring report	3
Completion date of the monitoring report	14/03/2023
Date of project design certification	18/02/2020
Date of Last Annual Report	N/A
Monitoring period number	3rd
Duration of this monitoring period	(01/01/2021) to (31/12/2021) The first and the end dates are included in the monitoring
Project Representative	GoodPlanet Foundation
Host Country	Cameroon
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	CDM small-scale methodology: AMS.III-F: "Avoidance of methane emissions through composting", version 12
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 13: Climate Action (mandatory)	Emission reductions	3,816	VER's
SDG 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Production of compost for agriculture	271	Tons
SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Creation of jobs	59	Number of people employed
SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable	Compost sold to local population	183	Tons

Table 2 – Product Vintages

		Amount Achieved
Start Dates	**End Dates**	**VERs**
01/01/2021	31/12/2021	3,816

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

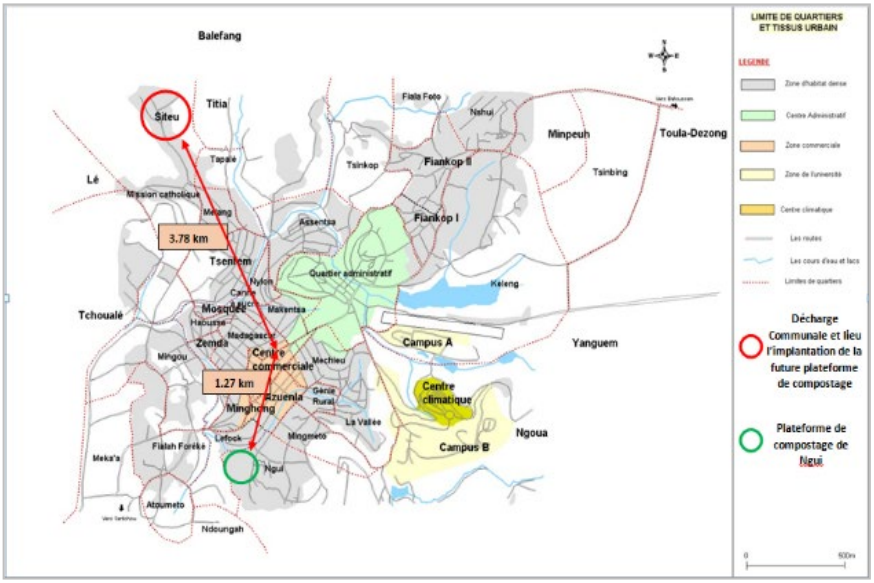
The purpose of the project activity is to implement a composting unit to treat the organic fraction of the domestic wastes generated from the city of Dschang (in Cameroon). The project is the first domestic waste composting site in Cameroon and working on a commercial basis. The effects of the project on the improvement of the local life conditions and on the local economic development are strong and have been elaborated following the three dimensions (environmental, economic and social) of the sustainable development. By avoiding the organic wastes dumping on the SWDS (solid waste disposal site), the composting process in the project activity has avoided methane emissions.
The use of the compost to agricultural soils enhances the water retention capacity of the soils and also contributed to minimize soil erosions. It can be moreover pointed out that the chemical fertilizer consumption has been reduced thus improving the food quality and inhabitant's health. On a long-term basis, compost is cheaper than chemical fertilizer, leading to income savings for the local farmers and market gardeners. The project has created jobs, mainly for less educated and marginalized people (a part being women). The people employed on the composting site have preferentially been informal reintegrated into the system, given a job with a regular salary and hygienic and secured work conditions. The project thus contributes to a sustainable development of the city.

A.2. Location of project

Cameroon, Western Region, Department of Menoua, Province of Dschang
The project has two production sites: one located in Siteu district, the second in N'gui district. The two production sites are 5.05 km apart.
The composting unit coordinates are:

Siteu: X : 10°2'39.20"E Y : 5°25'43.57"N	N'gui: X : 10°3'17.62''E. Y : 5°26'0.73'' N.

The following maps shows the two production sites. The solid waste disposal site and Siteu's production are in the same location, 3.78km from the city center, when Ngui is 1.27km from the city center.



A.3. Reference of applied methodology

The project uses the following methodologies and guidelines:

- CDM small-scale methodology AMS.III-F: "Avoidance of methane emissions through composting", version 12.
- CDM tool : "Emissions from solid waste disposal site", version 08.00, (EB 83, Annex 7, March 2th 2012),
- As well as the "Tool to calculate project and/ or leakage emissions from electricity consumption", version 1 (EB 39 Annex 7, May 16th 2008) and
- And the CDM tool : "project and leakage emissions from composting" versions 01.0.0, (EB 65, Annex 09, November 25th 2015)

A.4. Crediting period of project

>> 01/03/2017 to 28/02/2027 (10 years)

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

The composting of the city waste was initiated since the year 2015. The emission reductions are claimed for the monitoring period from the 01/01/2021 to the 31/12/2021. The total waste treated during the monitoring period is 4,644 tons.

Process of collection and treatment of wastes:
The project team (ERA Cameroun) collects and treats the wastes at the composting sites. The trucks collect the solid waste in Dschang city and deliver it to Ngui and Siteu sites. Once each truck has been unloaded at the composting site, the heterogeneous waste is submitted to a first separation stage on ground where coarse non-compostable products are removed. Then the remaining waste is dumped on tables to be finely sorted (manual sorting) and producing two homogeneous parts:

- First is the organic fraction, which is further sent to the composting windrows and
- Second is the fine non-compostable products.

Non-compostable products are considered as a final refuse, to be disposed in the SWDS.

For safety measures, each worker is provided with safety equipment, which are mandatory on the composting site.

Description of the installed technology (composting process):
The composting technology proposed in the project activity consists of a Biological Mechanical Treatment (BMT). A BMT system is a form of waste processing operation that combines a physical treatment (both manual and mechanical) and a biological treatment. In developed countries, BMT are increasingly used, due to regulations controlling the amount of organic matter allowed in landfills. In the proposed project, the biological treatment (composting) takes place during the fermentation in piles or windrows.

Composting consists in bio-degradation of organic matter in aerobic conditions. The composting parameters like temperature and aeration are continuously controlled by the production team during the two stage of composting: fermentation and Maturation. The temperature is controlled daily by plunging a temperature sensor in composting windrows. Fermentation is a two months process during which the windrows are turned 6 times. Then, during the maturation phase, an organic stabilization occurs. Please refer to the reference documents "Windrow Turning", provided for verification.

The physical part of the process is largely carried out manually to save both on energy and investment costs and to provide regular jobs to informal workers on the dumpsite.

The composting process includes the following steps:

i) Manual sorting to remove (or break) the coarse elements and inorganic waste components.

ii) Windrows preparation and control of bio-degradation conditions by manual turn-overs and

iii) Manual screening of the compost.

The photos of each process are provided below.

The project activity was started in the month December 2014 and the compost production was initiated on a large scale in 2015. The project estimates to save around 43 646 tons of CO2eq over a 10-year crediting period. The project was registered with the GS on 18th February 2019.
This is the third monitoring report for the project activity and it represents the following crediting year: 01/01/2021 to 31/12/2021.

B.1.1 Forward Action Requests

- **Forward Action Request # 1: FAR#1:** The ERA's commercial visits records shall be checked during the next verification.
  - As requested, the ERA's commercial visits records have been checked, please refer to the file "ERA's commercial visits".
- **Forward Action Request # 2:** The PD is requested to submit the database and record all the future visits.
  - Please refer to the file "ERA's commercial visits".

B.2. Post-Design Certification changes

There were no post-design certification changes, therefore not applicable.

B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

There were no deviations in the project activity compared to the approved project documents, therefore not applicable.

B.2.2. Corrections

Not applicable

B.2.3. Changes to start date of crediting period

The project registration was delayed due to the change in the project team, therefore the change in the first period of crediting from the 01/03/2017, instead of the expected date of 01/01/2015 (as mentioned in the registered PDD).

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

Not applicable

B.2.5. Changes to project design of approved project

Not applicable

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

The project monitoring is carried out by the local project team present on the composting site. A separate monitoring system has been followed to correctly collect and record the required data of each of the four monitored parameters linked to the emission reduction calculations. The monitored parameters monitored are explained as below:

There are four monitored parameters linked to baseline emissions:

i) **Fraction of methane captured at the SWDS (f):** Visits are done regularly (at least once a year) to the final disposal site. And, the baseline scenario includes a leveling of waste, but no methane capturing.

Information to be reported for monitoring: ***value of "f"***

ii) **Global Warming Potential (GWP) of methane and nitrous oxide**: The decisions under UNFCCC and the Kyoto Protocol have been taken into account (IPCC[1] AR6 report). The corresponding values are verified annually, and reference used for the corresponding values will be updated accordingly.

Information to be reported for monitoring:

- GWP_{CH4} *value (tons*CO_{2e}*/ton CH4),*
- GWP_{N2O} *value (tons*CO_{2e}*/ton N2O)*

iii) **Total amount of organic waste prevented from disposal per year:** Since the loads of the waste delivery trucks vary not only with the season but also with the volume of waste to be transported, we have chosen a local adaptation based on the calculation of the carrying capacity of the wheelbarrows used at the composting site.

The total amount of organic waste (W_x), delivered to each of both composting installations (Siteu and Ngui), is the yearly sum of the organic fraction sent for composting.

The total amount of organic wastes is calculated on the basis of the wheelbarrow load (carrying capacity) of corresponding products multiplied by the number of wheelbarrows. The average carrying capacity of the wheelbarrows is defined for each

[1] IPCC_AR6_WGI_Full_Report.pdf

product twice per year (one for the dry season and one for the wet season) on the basis of a representative number (10) of measurements of the carrying capacity of the wheelbarrows. The carrying capacity of the wheelbarrows is determined thanks to the weighing machine available on the site, calibrated following the legal local regulation.

Such procedure allows a much better accuracy of the total amount of organic waste delivered to the composting installations (Siteu and Ngui).

Monthly weight of entrant household waste:
WCW = (Number of organic fraction wheelbarrows) x (average weight of organic fraction wheelbarrows) + (Number of non-compostable fraction wheelbarrows) x (average weight of non-compostable fraction)

Information to be reported for monitoring:
- *Tons of organic waste treated in Siteu installation.*
- *Tons of organic waste treated in Ngui installation.*

- Since January 2018, the difference is made between the rejections of the sorting on the ground and the rejections of the sorting on the table. Also, every month ten wheelbarrows full of organic matter, ten wheelbarrows full of rejections of the sorting on the ground and ten wheelbarrows full of rejections of the sorting on the table are weighed. The averages thus obtained are applied to the number of wheelbarrows of organic matter and to the number of wheelbarrows of both types of rejections obtained daily during the concerned month.

- Considering the two sites, two seasons and different types of wastes/products, this average wheelbarrow weight was determined each month on each site.

- The average weight of the wheelbarrows is determined each month on each site.

Monthly weight of entrant household waste:

WCW = N° wheelbarrows full of organic matter in the month * + N° wheelbarrows full of rejections in the month

iv) Weight fraction of the waste type j during the year y

The waste composition is monitored independently for each source of organic waste. Household waste includes all of six waste categories defined in the AMS III.F methodology. (see table 2). For the complete characterization, please Refer to Section D2.

Waste source	Type j	Weight fraction
Household waste	Wood and wood products	2 %
	Pulp, paper and cardboard	5 %
	Textiles	7 %
	Food, food waste, beverages and tobacco	72 %
	Garden, yard and park waste	13 %
	Glass, plastic, metal and other inert waste	1 %

Table 2: Waste types for household waste during the monitoring period

According to the "methodological tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site", the sample characterization was made by the production manager at least once a month.

The protocol used for characterization is as follows:

500 kg of waste are sampled from 5 different trucks on different days if not enough delivery occurs on the same day. The samples are collected in different spot of the truck for representativeness.
The whole sample is then divided in 4 parts, manually homogenized and put back together.
A Fourth of this sample is then selected by slicing the waste pile in 4. This part is the one which is characterized.
The pile of waste is screen to separate waste bigger than 100mm and smaller than 100 mm. Then the same operation is done to separate waste bigger than 20 mm and smaller than 20mm. Each pile is then sorted into each category of waste type.
The following table is then filled by weighing each category of waste:

	Total		Wood and wood products	Food and food waste	Paper	Textiles	Garden waste	Inerts	Fines < 20
>100mm									
20<X<100	Total	Total used for cara[3]							
<20									
Total (kg)									
Total (%)									

Table 3: Characterization table

The characterization results are recorded and the annual average has been calculated for the different waste source. The recorded data have been provided for verification. Please refer the excel documents – "Characterization Campaign jan-dec 2021" for both the sites of Ngui & Situe.

Information to be reported for monitoring

- ***Weight fraction of the waste type j for each waste source as shown above in the table 2.***

For other sources such as fruit empty bunches, or green waste as they are composed of only one type they have been recorded as such. (green waste as green waste – fruit leftovers as green waste also etc.)

The obtained values weight fraction of the waste type for the present monitoring period has been provided below in the section D.2, page 20. An average of the values obtained for each month and for each composting platform was calculated and considered for the calculations. Also please refer the VER's calculation sheet for the obtained values.

The local team is highly competent to realize these monitoring surveys. The site manager is an agronomist, and each procedure has been implemented under his guidance wherever required.
The project is registered with GoldStandard and no other voluntary standard, therefore no double counting of Emission reductions is possible.

- ***Breakdown, maintenance, and repair events that occurred during the monitoring period***

There were minor maintenance and repairs carried out for the vehicles used for transporting the wastes. The reference documents on the maintenance have been provided for verification. Please refer the pdf copies of "Vehicle maintenance bill".

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/parameter:	φ
Unit	-
Description	Model correction factor to account for model uncertainties
Source of data	CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Value(s) applied)	0.85
Choice of data or measurement methods and procedures	According to CDM tool used, as not enough data is available to calculate φ, the default value was chosen. The default value of 0.85 corresponds to current project conditions: application B (project activity avoids disposal of waste at the SWDS) and humid/wet conditions (cf. climatic data in Annex 7).

Purpose of data	Emission reduction calculations
Additional comments	

Data/parameter:	Ox
Unit	-
Description	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering waste)
Source of data	CDM Methodological tool: Emissions from solid waste disposal sites" Version 08, page 14
Value(s) applied)	0.1
Choice of data or measurement methods and procedures	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Purpose of data	Emission reduction calculations
Additional comments	As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	F
Unit	-
Description	Fraction of methane in the SWDS gas (volume fraction)
Source of data	CDM Methodological tool: Emissions from solid waste disposal sites" Version 08, page 14
Value(s) applied)	0.5
Choice of data or measurement methods and procedures	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Purpose of data	Emission reduction calculations
Additional comments	As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	DOC_f
Unit	-
Description	Fraction of degradable organic carbon (DOC) that can decompose
Source of data	CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08, page 14
Value(s) applied)	0.5

Choice of data or measurement methods and procedures	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Purpose of data	Emission reduction calculations
Additional comments	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	MCF
Unit	-
Description	Methane correction factor
Source of data	CDM Methodological tool: Emissions from solid waste disposal sites" Version 08, page 15
Value(s) applied)	1
Choice of data or measurement methods and procedures	According to "Methodological tool: Emissions from solid waste disposal sites" Version 08". The water table is at least 11 meters deep2 and the SWDS is anaerobically managed: The placement of waste is managed (waste directed to specific deposit areas, a degree of control of scavenging and a degree of control of fires) and includes a leveling of waste and a mechanical compacting.
Purpose of data	Emission reduction calculations
Additional comments	The SWDS is both anaerobic and managed: waste is located to a specific place when it gets to the SWDS, a bulldozer levels the waste regularly, and guards are at the SWDS to make sure that no fire is voluntary started. See Annex 6 of the PDD. As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	DOC_j
Unit	-
Description	Fraction of degradable organic carbon (by weight) in the waste type j

[2]Information from the technical study to implement the SWDS in Dschang.

Source of data	CDM Methodological tool: Emissions from solid waste disposal sites" Version 08, page 16
Value(s) applied)	<table><tr><td>Waste type j</td><td>DOCj (% wet waste)</td></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 and other inerts</td><td>0</td></tr></table>
Choice of data or measurement methods and procedures	According to CDM "According to "Methodological tool: Emissions from solid waste disposal sites" Version 08"
Purpose of data	Emission reduction calculations
Additional comments	Waste that cannot clearly be attributed to one of those categories are assimilated in a conservative way to the one having the most similar characteristics. For example, after visual analysis particles smaller than 20 millimetres seems to be mostly organic matter thus they are assimilated to food waste. As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	k_j
Unit	1/year
Description	Decay rate for the waste type j
Source of data	CDM Methodological tool: Emissions from solid waste disposal sites" Version 08, page 17

Value(s) applied)	<table><tr><td colspan="2">Waste type j</td><td>Weather wet and tropical</td></tr><tr><td rowspan="2">Slowly degrading</td><td>Pulp, paper and cardboard (other than sludge), textiles</td><td>0.07</td></tr><tr><td>Wood and wood products and straw</td><td>0.035</td></tr><tr><td>Moderately</td><td>Other (non-food) organic putrescible garden and park waste</td><td>0.17</td></tr><tr><td>Rapidly degradin</td><td>Food, food waste, sewage sludge, beverages and tobacco</td><td>0.40</td></tr></table>
Choice of data or measurement methods and procedures	Climatic conditions in Dschang correspond to a tropical zone, with mean annual temperature >20°C and mean annual precipitation >1000mm.
Purpose of data	Emission reduction calculations
Additional comments	Cf Annex 7 in the PDD for climatic data. As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	EF_{power}
Unit	t_{CO2}/MWh
Description	Emission factor for grid electricity
Source of data	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" EB 39 Annex 7 May 16th 2008
Value(s) applied)	1.3
Choice of data or measurement methods and procedures	The electricity used in the project comes from the grid, and the project consumes more energy (in the present situation due to lighting) than the baseline (scenario A, option A1 of the document sub-cited). Thus, the conservative default value of 1.3 MWh can be used.
Purpose of data	Emission reduction calculations
Additional comments	For the time being, the project works without electric power on both sites. The connection to the local grid is considered in the future; the electric consumption has then been monitored through the electricity meter and the periodic invoices of the distribution company As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	$EF_{CH4,default}$
Unit	t_{CH4}/T
Description	Default emission factor of methane per ton of waste composted (wet basis)
Source of data	Methodological tool "Project and leakage emissions from composting". (Version 01.0.0)
Value(s) applied)	0.002
Choice of data or measurement methods and procedures	Default emission factor
Purpose of data	Emission reduction calculations
Additional comments	The emission factor was selected based on studying published results of emission measurements from composting facilities, literature reviews on the subject and published emission factors. Data from recent, high quality sources was analysed and a value conservatively selected from the higher end of the range in results. As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	$EF_{N2O,default}$
Unit	tN2O/T
Description	Default emission factor of methane per ton of waste composted (wet basis)
Source of data	See DATA AND PARAMETERS NOT MONITORED, . Methodological tool "Project and leakage emissions from composting. (Version 01.0.0) ": The emission factor was selected based on studying published results of emission measurements from composting facilities, literature reviews on the subject and published emission factors. Data from recent, high quality sources was analyzed and a value conservatively selected from the higher end of the range in results.
Value(s) applied)	0.0002
Choice of data or measurement methods and procedures	
Purpose of data	Emission reduction calculations
Additional comments	As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	GWP_{CH4}
Unit	t_{CO2e}/t_{CH4}
Description	Global warming potential of CH4
Source of data	GS_document -"Applicability of Global warming potential for Gold Standard for the Global Goals Projects", page 2, table 1 https://globalgoals.goldstandard.org/ru-2020-applicability-of-global-warming-potential-for-gold-standard-for-the-global-goals-projects/
Value(s) applied)	28
Choice of data or measurement methods and procedures	
Purpose of data	Emission reduction calculations
Additional comments	As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

Data/parameter:	GWP_{N2O}
Unit	t_{CO2e}/t_{N2O}
Description	Global warming potential of N2O
Source of data	GS_document-"Applicability of Global warming potential for Gold Standard for the Global Goals Projects", page 2, table 1 https://globalgoals.goldstandard.org/ru-2020-applicability-of-global-warming-potential-for-gold-standard-for-the-global-goals-projects/
Value(s) applied)	265
Choice of data or measurement methods and procedures	
Purpose of data	Emission reduction calculations
Additional comments	As per the GS, no requirement for an indicator for the parameters linked to the goal SDG 13

D.2 Data and parameters monitored

Data/parameter:	SDG 13 - f_y
Unit	-
Description	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y.
Source of data	Historical data on the amount captured on the SWDS by the municipality or the entity managing the SWDS
Value(s) applied	0
Measurement methods and procedures	-
Monitoring frequency	Once a year
QA/QC procedures:	-
Purpose of data:	-
Additional comments:	There is no capture / combustion of gas at the solid waste disposal site at the time of writing the Monitoring report and the municipality doesn't has it as a project.

Data/parameter:	SDG 13 - W_x
Unit	Tons
Description	Total amount of organic waste prevented from disposal in year
Source of data	Measurements by ERA (local team)
Value(s) applied	• Ngui : 3,571 • Siteu : 1,072 • **Total : 4,644**
Measurement methods and procedures	The methodological tool "project and leakage emissions from composting" allows two different methods to calculate the amount of composted waste. Option 1: Procedure using a weighing device will be preferably used when available on site Option 2 is based on the calculation of carrying capacity of each truck delivering waste to the composting site.

	In Dschang's case, in absence of a truck weighing device, and as the load of the trucks is very variable not only with the season, but also with the volume of waste to be transported, we have chosen a local adaptation of the option 2, based on the count of the number of wheelbarrows used to transport waste on the platform and on the calculation of the carrying capacity of these wheelbarrows. Once each truck has been unloaded, the heterogeneous waste is submitted to a first separation stage producing two more homogeneous flows: - organic fraction flow (organics) which is fed to the composting windrows (with wheelbarrows); - and the flow of non-compostable waste (transported with wheelbarrows), considered as a final refuse, to be disposed in the SWDS. The total amount of organic waste, Wx, delivered to each of both composting installations (Siteu and Ngui) is the yearly sum of these two flows. The total amount of organic wastes is calculated on the basis of the wheelbarrow load (carrying capacity) of corresponding products multiplied by the number of wheelbarrows. The average carrying capacity of the wheelbarrows is defined for each product twice per year (one for the dry season and one for the wet season) on the basis of a representative number (10) of measurements of the carrying capacity of the wheelbarrows. The carrying capacity of the wheelbarrows is determined thanks to the weighing machine available on the site, calibrated following the legal local regulation. The procedure is explained in the section C, part iii) page 9 to 12 of the monitoring report.
Monitoring frequency	10 times per month
QA/QC procedures:	Every month ten wheelbarrows full of organic matter, ten wheelbarrows full of rejections of the sorting on the ground and ten wheelbarrows full of rejections of the sorting on the table are weighed. The carrying capacity of the wheelbarrows is determined with the help of the weighing machine available on the site, calibrated following the legal local regulation. Calibration of weighing machines has been verified and certified by Cameroun's Ministry of Trade. Please refer to the PDF document "Justification of weighing machines calibration".

Purpose of data:	Emission reduction calculations
Additional comments:	Once the ten wheelbarrows have been weighed (QA/QC procedure), an average value is calculated to estimate the quantity of organic waste per wheelbarrow. The calculated average is noted in the last column of the tables of the PDF documents "Monthly weight…". To estimate the total of organic waste prevented from disposal during the month, the number of wheelbarrows with organic waste is noted and then multiplied by the average of organic waste contained in a wheelbarrow, which has been calculated as explained above. The quantity of waste prevented is estimated from the count of wheelbarrows and the characterization of the organic waste (please refer to the next data/parameter) Please refer to ER calculation excel sheet – "GS 4593_Confidential_VER_Cals_V2": "Year5. 2021"; cell D7, D8 & D9

Data/parameter:	SDG 13 - $P_{n,j,x}$
Unit	%
Description	Weight fraction of the waste type j in the sample n collected during the year x
Source of data	Characterization of raw waste made by ERA Cameroun in 2021 for ex-ante calculation. The figure used for emission reduction calculations are the mean of 12 different characterizations done from (01/01/2021)to (31/12/2021).
Value(s) applied	<table><tr><th>Type j</th><th>Weight fraction</th><th></th></tr><tr><td>Wood and wood products</td><td>2%</td><td rowspan="3">Please refer to ER calculation excel sheet – "GS 4593 Confidential VER Cals V1": Sheet Year5. 2021 – Column T40 to T45</td></tr><tr><td>Pulp, paper and cardboard</td><td>5%</td></tr><tr><td>Textiles</td><td>7%</td></tr></table>

	Food, food waste, beverages and tobacco	72%	
	Garden, yard and park waste	13%	
	Glass, plastic, metal and other inert waste	1%	
Measurement methods and procedures	A characterization is done every month by ERA Cameroun according to the characterization protocol on incoming waste (composed of six types of waste described by the methodology). Please refer to the excel files "Characterization Campaign jan-dec 2021".		
Monitoring frequency	Monthly		
QA/QC procedures:	Such measurement method is based on the NF X30-408 and NF XP X30-466 standards.		
Purpose of data:	Emission reduction calculations		
Additional comments:	Characterization have been done every month to insure reliable information on the nature of the waste collected. Please refer to the ER calculation excel sheet – "GS 4593_Confidential_VER_Cals_V2": Sheet Year5. 2021 – Column T40 to T45		

Data/parameter:	SDG 13 - EE_y
Unit	Kwh
Description	Electrical energy consumption for compost production in year y.
Source of data	Electricity meter.
Value(s) applied	909
Measurement methods and procedures	Measured by electricity meter.

Monitoring frequency	Once a month
QA/QC procedures:	-
Purpose of data:	Emission reduction calculations
Additional comments:	During the operation, the actual energy consumption is monitored through the electricity meter and crossed checked with the distribution company invoices. A sample of a scanned copy of the Electricity bills are provided for verification. Please refer to the ER calculation excel sheet – "GS 4593_Confidential_VER_Cals_V2": Sheet Year5. 2021 – Cell D50

Data/parameter:	SDG 2: Proportion of agricultural area under productive and sustainable agriculture / $Q_{y,treatment}$
Unit	Tons of compost
Description	Quantity of compost produced in year y
Source of data	ERA's recording
Value(s) applied	271
Measurement methods and procedures	Total quantity of the compost bags weighed and packed in sacks, are recorded by the team on the platform. The compost records are cross-checked by the project manager of the composting site.
Monitoring frequency	When necessary
QA/QC procedures:	Data is cross-checked with both sales record and process analysis. In order to follow the buyers of the compost, a sales and delivery records are maintained as a part of the monitoring plan. Please refer to the two Excel documents in the file "ERA database & commercial visits".
Purpose of data:	Estimating net benefits for the SDG 2.
Additional comments:	Considering the project budget and the high cost to monitor the "proportion of agriculture area under production and sustainable agriculture", the project activity has provided the total amount of compost produced per year, which is sold to local farmers for agriculture use, ensuring a sustainable and resilient agricultural practice.

	Please refer to the ER calculation excel sheet – "GS 4593_Confidential_VER_Cals_V2": Sheet Year5. 2021 – Cell D47

Data/parameter:	SDG 8: Proportion of informal employment in non-agriculture employment, by sex / Number of workers
Unit	Number
Description	Total number of workers employed due at the composting site of the project activity
Source of data	Employment contracts
Value(s) applied	59
Measurement methods and procedures	-
Monitoring frequency	When necessary
QA/QC procedures:	Each worker at the composting site sign a work contract and a copy of the contracts are stored at the site. The project manager keeps a track of all the work contracts. Keeping a healthy and safe work environment to avoid any work-related injuries. The project site manager keeps a regular check on the use of the PPE by each worker on the site.
Purpose of data:	Monitoring the SDG 8 - Promote inclusive and sustainable economic growth, employment and decent work for all
Additional comments:	Few scan copies of the payslips were provided for verification, please refer to the pdf document on the "salary" paid during the year 2021.

Data/parameter:	SDG 11: Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities / i) Total amount of organic waste treated into compost ii) Compost analysis and its application for agriculture iii) Air and water quality near the surrounding areas of the waste composting facilities
Unit	i) tons of organic waste treated in year ii) tons of compost sold in year

	- number of clients monitored by the commercial team iii) number of complaints about air and/or water quality
Description	This parameter is to ensure application of compost to organic soil and assure no foul odors or water pollution in the surrounding areas of the activity.
Source of data	ERA's commercial visits record. Sales and delivery record For air and water, an Inhabitants Complaint book is maintained at the site.
Value(s) applied	i) 4,644 tons of organic waste were treated in 2021 ii) 183 tons of compost were sold in 2021 iii) 0 complaint about air and/or water quality
Measurement methods and procedures	Compost: The total amount of compost sold is maintained and recorded by the project team. It is done through on-site visits on a representative sample of clients. Sheets of good practices on the use of compost (written in French) are drafted, discussed and made available to users. Air Quality: The air quality due to the project activity is also monitored in this parameter to assure that there are no complaints of foul odours from the surrounding inhabitants. Water Quality: By measuring the water quality into the situe wells.
Monitoring frequency	Compost : Sales visits are done twice a year to the main clients. Air Quality: once a year by the project manager. Water Quality: Once a year by the project manager.
QA/QC procedures:	In order to follow the buyers of the compost, a sales and delivery records are maintained as a part of the monitoring plan.
Purpose of data:	Monitoring the SDG 11 - Make cities inclusive, safe, resilient and sustainable
Additional comments:	The aerobic conditions in soil application are verified during the field visits. Please refer to all the documents in the folder "justificative compost process". The project could not hire an agronomic expert because it has been affected financially due to Covid pandemic. If the financial situation of the project allows it, the project can think of getting an agronomic expert in the future crediting years.

	In order to follow the buyers, sales records are part of the monitoring plan, as well as delivery record. They include the type of crops on which compost is applied. A registry of inhabitants' complaints is maintained at the composting site regarding the foul odors or water quality complaints. And so far, both composting sites have not received any complaints regarding these parameters. Please refer to the file "Grievance book 2021" in french. A study about the environmental impact of the project was carried out for both the sites - Ngui and Siteu. As per the report, no water or air quality problem has been raised by the project. This report was also reviewed and validated by the governmental agency – "Divisional Delegation of Environment, Protection of Nature and Sustainable Development" of the Republic of Cameroon. Please refer to the ER calculation excel sheet – "GS 4593_Confidential_VER_Cals_V2": Sheet Year5. 2021 – Cell D48

D.3. Comparison of monitored parameters with last monitoring period

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period
SDG 13 - f_y	0	0
SDG 13 - W_x	4,644 t	2,722 t

SDG 13 - $P_{n,j,x}$	Type j: Wood and wood products; Pulp, paper and cardboard; Food, food waste, beverages and tobacco; Textiles; Garden, yard and park waste; Glass, plastic, metal and other inert waste Weight fraction: 2%; 5%; 7%; 72%; 13%; 1%	Weight fraction: 2%; 6%; 55%; 6%; 17%; 13%
SDG 13 - EE_y	909 kWh	823 kWh
SDG 2 : Proportion of agricultural area under productive and sustainable agriculture / $Q_{y,treatment}$	271 t	250 t
SDG 8 : Proportion of informal employment in non-agriculture employment, by sex / Number of workers	59	48
SDG 11 : Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities / i) Total amount of organic waste treated into compost	183 t	312 t
SDG 11 : Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities / ii) Compost analysis and its application for agriculture	Not reported	23 clients
SDG 11 : Proportion of urban solid waste regularly	0 complaint	0 complaint

collected and with adequate final discharge out of total urban solid waste generated, by cities / iii) Air and water quality near the surrounding areas of the waste composting facilities

D.4. Implementation of sampling plan

Characterization sampling plan:

The protocol used for characterization is based on the NF X30-408 and NF XP X30-466 standards and is as follows:
The aim of this sampling is to get a good representation of the waste of Lomé, and of incoming waste on the platform. To insure a representative sampling, waste is gathered from different trucks in order to represent at best incoming waste.

500 kg of waste are sampled from 5 different trucks on different days if not enough deliveries occur on the same day. The samples are collected in different spot of the truck for representativeness.
The whole sample is then divided in 4 parts, manually homogenized and put back together.

A Fourth of this sample is then selected by slicing the waste pile in four. This part is the one, which is characterized.
The pile of waste is screen to separate waste bigger than 100mm and smaller than 100 mm. Then the same operation is done to separate waste bigger than 20 mm and smaller than 20mm. Each pile is then sorted into each category of waste type.

The details are also provided on section C page 10 and 11 of the monitoring report.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

SDG 2: Zero Hunger

Without the composting project, there would have been no production of compost. Therefore, the baseline value for this indicator is zero tons of compost.

SDG 8: Decent Work and Economic Growth

Without the composting project, there would have been no creation of employment for the local communities. Therefore, the baseline value for this indicator is zero employment at the composting site.

SDG 11: Sustainable Cities and Communities

Without this composting project, there would have been no sales of compost to local farmers. Hence no support of local sustainable practices. Therefore, the baseline value for this indicator is zero tons of compost.

SDG 13: Calculation of Baseline GHG emissions

As explained in the paragraph B.6.3 of the PDD, the GHG sources, sinks and reservoirs for the baseline are the methane emissions avoided from preventing waste disposal at the solid waste disposal site. These emissions are calculated as follow:

$$BE_{CH_4,SWDS,x} = \varphi.(1-f).GWP_{CH_4}.(1-OX).\frac{16}{12}.F.DOC_f.MCF.\sum_{x}^{Z}\sum_{j}W_{j,y}.DOC_j.e^{-k_j.(Z-x)}.(1-e^{-k_j})$$

Where:

BECH4,SWDS,y	Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y in (tCO2e)	Calculated
ϕ	Model correction factor to account for model uncertainties	ϕ = 0.85
F	Fraction of methane captured at the SWDS and flared, combusted or used in another manner	f = 0 Monitored
GWP_{CH4}	Global warming potential (GWP) of methane, valid for the relevant commitment period	GWP_{CH4} = 27 Monitored
F	Fraction of methane in the SWDS gas (volume fraction)	F = 0.5

DOCf	Fraction of degradable organic carbon (DOC) that can decompose	DOCf = 0.5
MCF	Methane correction factor	MCF = 1
Wj,k	Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons).	Calculated from two Monitored parameters: Total amount of organic waste prevented from disposal and Weight fraction of the waste type j
DOCj	Fraction of degradable organic carbon (by weight) in the waste type j	Wood 43 Pulp, paper 40 Textiles 15 Food waste 24 Green Waste 20 Inert waste 0
Kj	Decay rate for the waste type j	Wood 0.035 Pulp, paper 0.07 Textile 0.07 Food waste 0.40 Garden waste 0.17 Inert waste 0
j	Waste type category	Household waste
X	Year for which methane emissions are calculated	x runs from the first year of the crediting period (x=1) to year z, with z=10
Z	Final year considered for methane emissions calculation.	Following suggestion by the GS TAC, Z =10 is used.

The factor "ϕ*(1-f)*GWP_{CH4}*16/12*F*DOC_f *MCF", which could be considered as a constant K, independent from the year and from the waste type is equal to:

K = 0.85*28*(1-0) * 16/12 * 0.5 *0.5 *1 = 7.140

The formula becomes then: $$BE_{CH4,SWDS,y} = 7.140 * \sum_{x}^{z} \sum_{j} W_{j,y} . DOC_j . e^{-k_j(z-x)} . (1 - e^{-k_j})$$

Calculation (01/01/2021) to (31/12/2021) :

- $BE_{CH4,SWDS,2017}$ = 4,324 tCO2

E.2. Calculation of project value or estimation of project situation of each SDG Impact

SDG 2 : Zero Hunger

This project produced 271 t of compost in 2021, helping to produce food locally.

SDG 8: Decent Work and Economic Growth

This project created 59 jobs in 2021.

SDG 11: Sustainable Cities and Communities

Thanks to this project, 183 t of compost have been sold in 2021. This compost, sold locally allows to sustain local durable farming practices.

This compost is used by local communities as a soil amendment. It allows them to feed crops and build soil fertility.

One of the examples of the Farmers training on the Compost application

Growing cultures thanks to Compost used as soil amendment

SDG 13: Calculation of GHG emissions and/or removals for the project

As explained in the paragraph B.6.3 of the PDD, the project GHG emissions are:

i) CO2 emissions on account of electricity used by the project activity facilities for screening and mechanical sorting of compost.
ii) Methane emissions during composting process
iii) Nitrous oxide emissions during composting process

These emissions are calculated as follow:

$$PE_{comp,y} = PE_{EC,y} + PE_{CH4,y} + PE_{N2O,y}$$

Where:

$PE_{comp,y}$= Project activity emissions in the year "y" (tonnes of CO2 equivalent)
$PE_{EC,y}$ = Emissions from electricity consumption in the year "y",
$PE_{CH4,y}$ = Methane emissions during composting process during year "y"
$PE_{N2O,y}$ = Nitrous oxide emissions during composting process during year "y"

Emissions from electricity consumption

$PE_{y,power} = EEy * EF_{CO2} * (1+ TDL)$

Where

EEy	Electrical energy consumption in the year y (kWh)	Monitored
EF_{CO2}	CO2 emission factor from electricity produced from fossil fuel	EF CO2 = 1.3 kg CO2e/kWh
TDL	Average technical transmission and distribution losses for providing electricity to source j in year y	0.2

Calculation (01/01/2021) to (31/12/2021):

- **$PE_{y,pow}$**= (1+0.2) * 0.909 * 1.3 = 1 tC02

Methane emissions during composting process

$$PE_{y,comp} = Qy * EF_{composting} * GWP_{CH4}$$

Where

Qy	Quantity of raw waste treated in the year y (tonnes)	Monitored
$EF_{composting}$	Emission factor for composting of organic waste (t CH4/ton waste treated).	$EF_{composting}$= 0.002t CH4/t waste treated on a wet basis.
GWP_{CH4}	Global warming potential (GWP) of methane, valid for the relevant commitment period	GWP_{CH4} =28

Calculation (01/01/2021) to (31/12/2021):

- **$PE_{y,comp}$**= 4,644*0.002* 28 = 260 tC02

Nitrous oxide emissions during composting process

Nitrous Oxide emissions are calculated following the default values of the tool to determine "project and leakage emission from composting" versions 01.0.0, as the monitoring method is too expensive for a project this size.
$PE_{N2O,y}$ = Qy * $EF_{N2O,y}$ * GWP_{N2O}
Where

Qy	Quantity of waste composted in year y (t/yr)	Monitored data
$EF_{N2O,y}$	Emission factor of methane per tonne of waste composted valid for year y (t N2O / t)	EFN2O,y= 0.0002 t N2O /t
GWP_{N2O}	Global warming potential of N2O (TCO2e/t N2O)	GWPN2O=265

Calculation :

- (01/01/2021) to (31/12/2021):
  - **$PE_{y,N20}$**= 4,644* 0.0002 * 265 =246 tC02

The various scans and pieces of document linked to this monitoring report are separately provided on the GS registry.

2021 :

- Characterization Campaign jan-dec 2021 NGUI
- Characterization Campaign jan-dec 2021_ SITEU
- Justificative electricity bills 2021
- Number processed Wheelbarrows Ngui 2021
- Number processed Wheelbarrows Siteu 2021
- Personal Protection Equipements use and purchase Bill 2021
- Scan Weight Wheelbarrow 2021 NGUI
- Scan Weight Wheelbarrow 2021 Siteu

E.3. Calculation of leakage

There is no leakage in this project according to the methodology.

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG Impact	Baseline estimate	Project estimate	Net benefit
Emission reductions (unit: tons of CO2eq)	4,324	508	3,816
Proportion of agricultural area under productive and sustainable agriculture (unit: tons of compost produced)	0	271	271
Proportion of informal employment in non-agriculture employment, by sex / Creation of jobs (Unit: Number of jobs created)	0	59	59
Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities / Compost application (unit: tons of compost)	0	183	183

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values[3] achieved during this monitoring period
13 (emission reduction)	6 557 tCO2eq	3,816 tCO2eq
2 (compost produced)	812 tons	271 tons

[3] Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

8 (jobs created)	54 beneficiaries	59 beneficiaries
11 (compost sold)	520 tons	183 tons

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

The quantities of VER (SDG 13) have not been achieved as estimated. The VER estimation was originally based on the PDD considering larger quantities of waste to be treated. This explains the lower volume of VER than the estimated value in the PDD.

The number of beneficiaries (employed people) is bigger than expected because the estimation about the number of employees needed was done with a very conservative value.
For the compost production, it was estimated in the Transition annex around 1800 tons of compost would be possible to be produced per year. This goal has not been achieved in 2021 because we have not achieved the same amount of waste collected as expected in the PDD (10 000 tons).

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

The SDG impacts have been lower than what was estimated, except for the number of employees This is because, we have underestimated the number of employees required for the amount of waste to be treated.

SECTION F. SAFEGUARDS REPORTING

Not applicable

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

>>None

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

>>None

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

>> The PD has provided a formal declaration that no legal contest has arisen with the project during the monitoring period.

Revision History

Version	Date	Remarks
1.1	March 2021	
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption