THE GOLD STANDARD MICRO-SCALE SCHEME PROJECT DESIGN DOCUMENT FORM - Version 2.2

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SECTION A. General description of micro-scale project activity

A.1 Title of the micro-scale project activity:

Municipal waste composting in Dschang, Cameroon.

Version 4: 9th August 2018

A.2. Project participants:

ERA Cameroun is a Cameroonian NGO created in 1995. Since its creation, ERA Cameroun develops activities aiming at reducing the amount of waste both in cities and rural areas, increasing access to drinkable water in suburbs of major cities, and in secondary cities, and limiting greenhouse gas emissions. Era Cameroun also develops clean technologies for decentralized energy.

Dschang's municipality was first created in 1954, as a "rural mixed municipality". In 2007, with the decentralization law, it was built as an independent municipality. Since 2007, municipalities are in charge of solid waste management.

Gevalor is a French association, created in 2004 to develop solutions for waste management adapted to the specific conditions of developing countries. Gevalor supports its local partners in development of their projects and in access to carbon credits in order to allow them to reach a technical and financial autonomy. Since 2010, Gevalor works with ERA Cameroun to develop a composting platform in Dschang.

GoodPlanet is a French foundation created in 2005 to raise public awareness on environmental protection and to bring practical solutions to the Earth's ecological crisis. With its program Action Carbone Solidaire, GoodPlanet develops and supports community-based projects with strong environmental, economic and social benefits.

Etc Terra is a French association implementing projects that combine economic dynamism and natural preservation in developing countries.

See Annex 1 for contact information of project participants.

Africompost is a joint program between Gevalor, GoodPlanet and Etc Terra to support the development of six composting units in Africa. See Annex 2 for more details on Africompost, and Annex 3 for the contract between ERA Cameroun, GoodPlanet, ETC Terra and Gevalor.

A.3 Description of the micro-scale project activity:

A.3.1. Location of the micro-scale project activity:

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A.3.1.1. Host Country:

Cameroon

A.3.1.2.	Region/State/Province etc.:

Western Region, Department of Menoua, Province of Dschang

A.3.1.3.	City/Town/Community etc:

Dschang

A.3.1.4. Details of physical location, including information allowing the unique identification of this micro-scale project activity:

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:	N'gui:
X : 10°2'39,20"E	X : 10°3'17,62''E.
Y : 5°25'43,57"N	Y : 5°26'0,73'' N.

The following maps show:

- the two production sites, as well as the dumpsite. 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.
- the city boundaries
- the project boundary is presented hereafter in paragraph B3

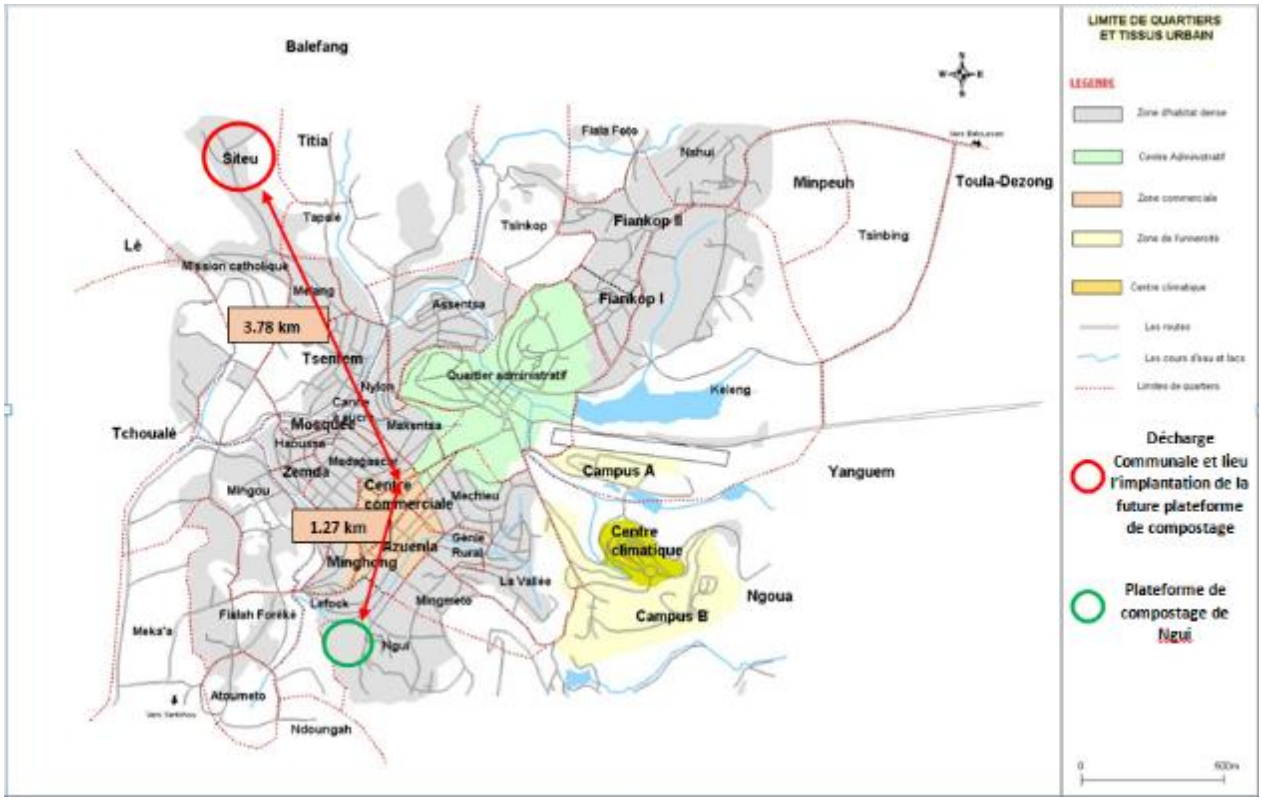

Figure : map of Dschang city center and production sites

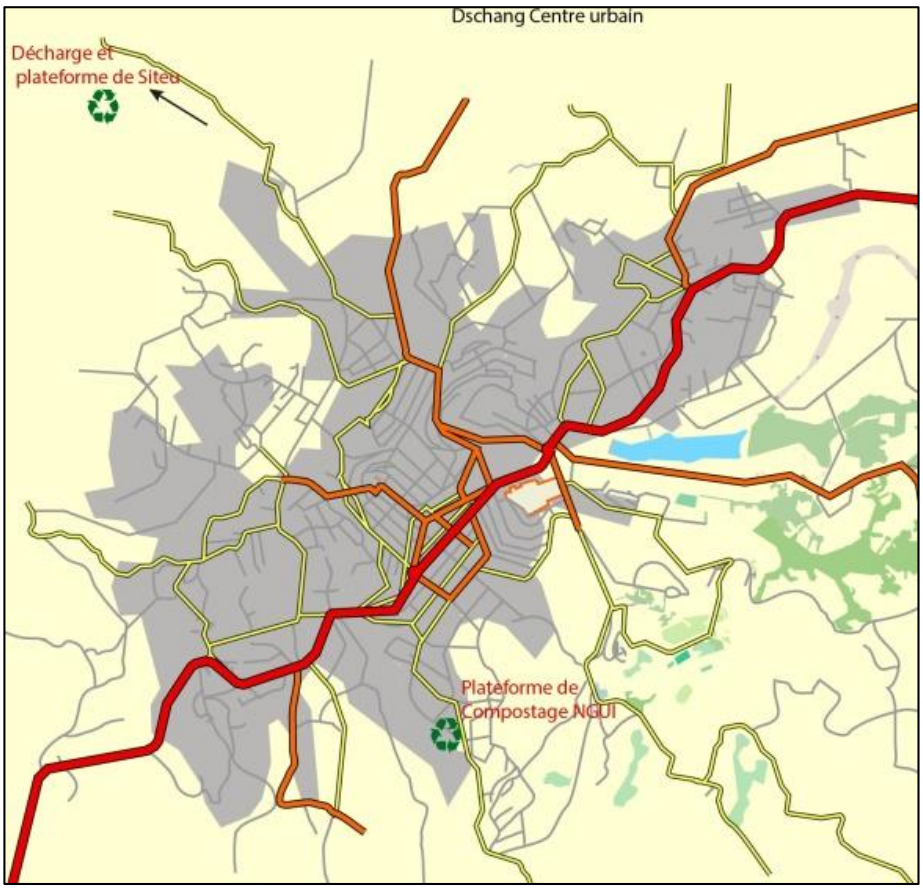

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Figure 2: map of Dschang city urban center

A.3.2. Description including technology and/or measure of the micro-scale project activity:

The objective of the proposed project is the implementation of a composting unit for the organic fraction of the domestic waste generated from the city of Dschang (Cameroon).

Dschang city has 120 000 inhabitants in its urban center and 220 000 if its rural surroundings are included (267 square kilometers). Dschang city produces about 35 000 tons of waste per year (on a wet basis +/-15 %). Around 20% of this waste is being collected and disposed of on an official Solid Waste Disposal Site (SWDS) designed and implemented between 2006 and 2008. The situation is described by the municipality in Annex 4 and by the characterization done by Elans in 2008 (please refer the Annex 18a,18b and Annex 10).

As per the law n° 96/12 dated August 5th, 1996, article 46 (see annex 19), the responsibility of domestic waste management has been transferred from the Central Government to the Municipalities. Presently there are no specific regulations imposing how to manage waste. Therefore, the project is consistent with existing regulation.

Dschang's Municipality being responsible of domestic waste management is also responsible of corresponding methane emissions. The project participants, whose objective is to lower methane emissions, are joint owners of the corresponding carbon credit. They have agreed together (see corresponding agreement in annex 17) to mandate GoodPlanet to valorize carbon credits and have decided how to split the corresponding carbon revenues. As a consequence, GoodPlanet is considered as the VERs owner.

In addition, Dschang City has signed with Era different cooperation agreements (19 04 2012, 15 01 2013) to improve the waste management system of the city). They include the obligation for Era to compost the organic fractions of the waste and to help the Municipality in searching corresponding financial resources. But the proposed composting activity would not have been developed from a pilot level to the present capacity without the funds received from the EU with a contract signed in December 2014.

YEAR	2012-2013	2014	2015	2016
EVENTS	Cooperation agreements ERA/Dschang municipality on waste management (April 2012 and January 2013)	EU funding contract signed in December	Reception of first EU funds by municipality	Construction of new platform in Siteu and new infrastructure in Ngui
ACTIVITY	Waste management improvement – composting pilot in Ngui – funding search	Waste management improvement – composting pilot in Ngui– funding's search	Waste management improvement – composting pilot in Ngui	Ngui and Siteu composting activity extend

The baseline corresponds to the situation of the legal framework where the municipality has contracted with associations to collect the domestic waste in some part of the city and collect it itself in other parts and finally stockpile them in a SWDS (solid waste disposal site) favoring methane emissions: this situation is usual in Cameroon.

The quantity of waste per inhabitant (220kg/inhabitant/year or 0.6 kg/inh/day, or 26 400 t/year for the urban center) is consistent with published data[1]. The percentage of organic matter is around 80%. Due to climate, humidity varies according to the season, from 70% in dry season up to 80% in rainy season.

ERA Cameroon aims at composting an increasing quantity of the organic waste fraction to produce valuable compost. The increase of treatment capacity is progressive and should reach about 10 000 tons (wet basis) per year. Presently, taking into consideration its economical and physical means, and also the existing alternatives (as home composting) the Municipality is not considering for now and for foreseeable future to collect more than 10 000 tons of domestic waste. For the time being the Municipality collects 8 000 t/year.

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The proposed project technology consists in 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. 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 technology includes:

[1]- Charnay F., (2005). Compostage des déchets urbains dans les pays en Développement : élaboration d'une méthodologie pour une production pérenne de compost. Thèse de Doctorat, Université de Limoges (France), Faculté des Sciences et Techniques, 277p.
- The Growing Complexities and Challenges of Solid Waste Management in Developing Countries Sandra Cointreau, Solid Waste Management Advisor, The World Bank September 2007

- Manual sorting to remove coarse elements and inorganic waste components, including sand and waste presenting a risk of compost contamination,
- Coarse elements are broken if possible or cut to be composted,

Figure 3 : Waste sorting

Figure 4 : Manual turn overs

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

- Screening by manual screens or mechanical trommel.

Figure 5 : Compost screening

The combination of the below will warranty the absence of dangerous impurities in the final product:

- sorting process of entering waste: waste suspected to contain heavy metals or persistent organic pollutants such as industrial waste or medical/hospital waste is diverted from composting,
- Elimination of pollution sources during the process (as batteries, glass fragments, electronic devices or plastics),
- Strict control of oxidation and temperature sanitizing the compost,

The production should increase progressively over the 10 years implementation of the project thus facilitating:

- an investment allocation over several years,
- workers training to these new processes,
- development of a compost market in the meantime,
- municipality adaptation to this new situation.

ERA Cameroon has been provided by Dschang municipality with a 3 057 m² land field in N'gui, and a 7 504m² plot in Siteu, Ngui's site being publicly owned, and Siteu's site being rented by the municipality to a local community with a long term agreement (20 years – see Annex 16).

The entities collecting waste in the surroundings of the N'gui composting site deliver the waste to the composting unit, where waste is sorted out. The inert fractions -non compostable- are collected by waste trucks from the municipality and brought to the SWDS.

Waste brought to Siteu, is sorted out by the workers team, and inert are directly thrown into the SWDS, which is located downstream from the platform, to facilitate such disposal. (see picture)

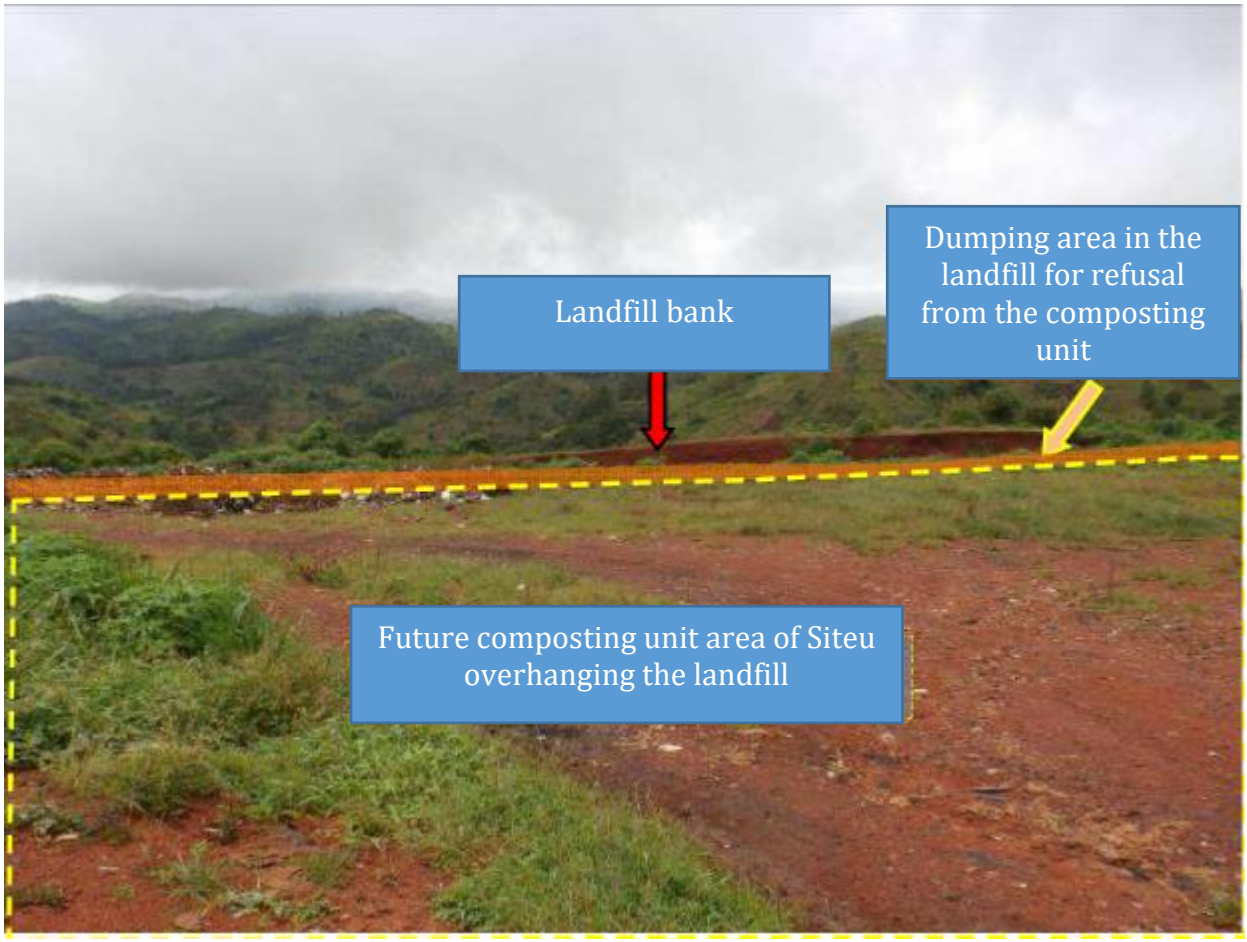

Figure 6: Inert disposal at Siteu.

The considered capacity treatment of ERA Cameroon should increase as follows:

Year	Household waste (wet tons)
1 : 2015	2 000
2 : 2016	4 000
3 : 2017	7 000
4: 2018	10 000
5 : 2019	10 000
6 : 2020	10 000
7 : 2021	10 000
8 : 2022	10 000
9 : 2023	10 000
10 : 2024	10 000

Preference will be given to waste richer in organics, such as market waste, green waste, fruit bunches.

The project was preceded by an experimental pilot operation.

The actual project comprises:

- Progressive transformation of the experimental plant into a commercial plant for waste sorting and composting. It should reach after 4 years the yearly input capacity of 10 000 tons (wet basis). The corresponding compost production is considered to be about 1 800 tons per year.
- Job creation: workers are in charge of sorting out entering waste, handling it on site, constituting and turning over windrows, screening and handling the compost, maintaining the composting site and equipment. To keep investment low, save energy and keep a high number of employees, the mechanization of the process will stay at a low level.
- The optimization of the process parameters to improve productivity and to control greenhouse gases production through aeration and temperature
- The development of the compost market around the city, through demonstration operations: such as market development is a prerequisite for the sustainability of the approach, after the end of the crediting period.

The project will be the first domestic waste composting site in Cameroon working on a commercial basis. The effects of the project on improvement of local life conditions and economic development are strong and could be broken into the three dimensions of sustainable development: environmental, economic and social.

By diverting organics from anaerobic fermentation producing methane on the SWDS, the process will avoid methane emissions. Based on investigations and calculation, the project will prevent the emission of around 43 646 tons of CO_2eq over a 10 years crediting period from 2015 to 2024. The investment will take place during the period 2015-2024. The beginning of crediting period is January 1st 2015, corresponding to the reception of the grant provided by European Union for construction of infrastructures on the 2 platforms.

Thanks to the composting unit, the SWDS will have a longer lifetime as less waste will be disposed, the neighborhood will be cleaner, soils and underground water will be less polluted. The City Council, saving money, would be able to reinvest it in order to improve the waste collection system.

The addition of compost to cultivated soils brings organic matter, fertilizing elements and enhances water retention capacity of soils; it also contributes to minimize erosion. On a long term basis, compost is cheaper than chemical fertilizer, saving money for the agriculture and market gardeners.

The project will create jobs, mainly for less educated and marginalized people (a large part being women), whom will be given a job with a regular salary and working conditions with prevention of risks and sanitary controls.

It can be moreover pointed out that the chemical fertilizer consumption will be reduced thus improving the food quality and inhabitant's health.

The project will thus contribute to a sustainable development of the city.

The full process has been designed and organized to avoid as much as possible any negative impact on workers' health, taking into consideration the previous experience gained on Lomé project. In addition, individual protection equipment is provided to the workers such as leather and plastic gloves, security boots, scarfs and working cloths.

A systematic tetanus toxoid vaccine is provided to the workers.

A.3.3 Estimated amount of emission reductions over the chosen crediting period:

The ten years crediting period will allow around 43 646 tons of $CO_{2,eq}$ emission reductions.

Year	Estimated Emission reductions
Year 1	1 531
Year 2	2 977
Year 3	5 055
Year 4	6 933
Year 5	6 557
Year 6	6 061
Year 7	5 395
Year 8	4 484
Year 9	3 217
Year 10	1 432
Total reduction emission	**43 646**
Average annual reduction emission	**4 364**

A.3.4. Public funding of the micro-scale project activity:

The project implementation is financed by different public funding's:

- French Development Agency (AFD- Agence Française de Développement) and French Global Environment Facility (FFEM - Fonds Français pour l'Environnement Mondial) via Africompost program,
- European Union via its program Europe'Aid.

Such funds are used for the project development in the first years. After a first investment phase, the project aims at financial autonomy by selling compost and other recycled products and by valorizing VERs with private companies. Therefore, public funds are not used to buy carbon credits, and then do not result in a diversion of Official Development Assistance (ODA).

In conclusion, ODA is used to support the development of the composting activity; VERs to be generated will be retailed to GoodPlanet partners in order to constitute a complementary income for the project.

Please refer to ODA declaration form (Annex 5).

SECTION B. Application of an existing baseline and monitoring methodology or of a new methodology submitted as part of this project activity

B.1. Title and reference of the existing or new baseline and monitoring methodology applied to the micro-scale project activity:

The project uses a CDM small scale methodology AMS.III-F: "Avoidance of methane emissions through composting", version 12.

In addition, we used also:

- the Methodological tool "Emissions from solid waste disposal sites", version 8.0, (EB 94, Annex 7, 4 May 2017
- the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation", version 3.0
- the Methodological Tool Demonstration of additionality of small scale project activities. Tool 21, version 11

the tool to calculate "Project and leakage emissions from composting", versions 2, (EB 65, Annex 09, November 25th 2011), A deviation, previously accepted by GS for the Lomé project (GS 1147, paragraph B6.1, baseline emissions) has been adopted in the present PDD. The corresponding details are described hereafter, in paragraph B6.1

B.2 Justification of the choice of the methodology and applicability:

The project qualifies as a type III small scale activity as it reduces GHG emissions in a quantity less than 60 $ktCO_2e/yr$ and moreover qualifies as a micro scale project for Gold standard as it reduces less than 10 $ktCO_2e/yr$. It qualifies under category III.F as the composting activity will prevent methane from being produced in disposal sites by treating the waste aerobically.

The organic matter will be treated using aerobic biological treatment and applied to soil under aerobic conditions, thus preventing methane from being produced through its anaerobic decay in disposal sites. The project does not include methane recovery or waste combustion.

Technology / measure

1. This project treats waste by composting it, which is a controlled aerobic treatment (see A.3.2 project technology). Waste would otherwise decay anaerobically in a SWDS (see B.4 description of baseline scenario, pictures of the existing SWDS are available in Annex 6).

2. The project activity does not recover or combust landfill gas from the disposal site. It treats waste only by composting and does not undertake controlled combustion of the waste that is not treated biologically in a first step. Non-composted waste goes to the SWDS (see A.3.2). Project activities do not involve co-digestion of organic matters.

3. The project emission reductions reach a maximum of 6 933 TCO_2eq per year (see table A.3.3) thus less than 60 000 tCO_2eq / year.

4. The project activity composts organic fraction of municipal solid waste. See section A.3.2. It may include biomass waste from small agro industries that is today collected together with other waste and brought to the SWDS. The project does not compost biomass from agricultural waste nor manure.

5. This project does not expand an existing project.

6. The project does not co-composts waste-water or solid biomass.

7. N/A[2]

8. N/A[2]

9. Waste is transported at a maximum distance of …km and compost is transported at a maximum distance of …km.

See hereafter § "boundary"

10. The produced compost is handled aerobically and the conditions of aerobic compost application are ensured.

    The conditions of compost soil application will be monitored, through visits in the fields twice a year. A minimum of 30 % of the compost tonnage sold in the previous semester will be controlled. It will be checked that the compost is not buried deeper than 50 cm or in water saturated soils.

    Regular visits at the clients' are organized by the commercial team and they ensure of the clients' good understanding of the application procedure.

11. The produced compost is treated neither thermally nor mechanically. Thus AMS III E is non-applicable.

12. Produced compost is not stored under anaerobic conditions.

    Compost is put in bags and delivered to clients in a short delay after processing it, as demand for compost is very high.

    Regarding § 18 of the methodology, "Leakage", the compost will not be disposed in a SWDS, as it is entirely sold to people using it in soil.

[2] The project does not co-compost waste –water or solid bio-mass

Leakage

17 and 18. Leakage effects does not need to be considered in this project as the project technology equipment is not transferred from another activity, nor is the existing equipment transferred to another activity.

Commercial-scale domestic waste composting projects have not been implemented to date in the country, taking into consideration the initial barriers (investment, compost market development, operating cost, know-how). The assistance of carbon market constitutes an incentive to justify the risk involved in building domestic waste composting plants in Cameroon.

B.3. Description of the project boundary:

Boundary

Here, then the project boundary includes:

a) The waste generated from the Dschang city is collected and disposed at the solid waste disposal site (SWDS). The SWDS is about 4 km away from Dschang city centre, in a suburb called Sinteu. The coordinates of this SWDS are:

X: 10°2'39,20"E

Y: 5°25'43,57"N

b) N/A*: the project does not co-compost waste water

c) The 2 composting platforms are located:

- one on the SWDS site, at **Siteu**, coordinates:

X: 10°2'39,20"E

Y: 5°25'43,57"N

- and the other in **N'gui** coordinates:

X: 10°3'17,62'' long E.

Y: 5°26'0,73'' lat. N.

d) The compost is mainly sold to market gardeners and to farmers around Dschang (in Menoua department, the furthest being in Penka Michel), elsewise it is sold to people living within residential areas in Dschang, for use in their gardens.

e) The itinerary between a, c and d is shown on figure 2 page 4

*"b" does not appear as the project does not co-compost waste water.

the point A corresponds to the city of Dschang, where all the waste treated on the platform is being collected from.

The coordinates of the angles of polygon (B, C, D, E, F) defining project boundary are:

Points	Latitude N	Longitude E
A=Dschang		
B=Santchou	5°17’05’’	9°58’17’’
C=Fongo Tongo	5°30’51’’	9°58’38’’
D=Nkongni	5°34’17’’	9°58’38’’
E=Penka-Michel	5°27’34’’	10°19’20’’
F=Fokoue	5°25’22’’	10°05’19’’

The boundary defines a surface of about 1 380 km², corresponding to the area of Menoua department.

It should be reminded that emissions corresponding to waste or compost transport is not considered in the tool: the compost that is transported to its place of application in the project activity, would replace the need to transport fertilizer to the same place of application.

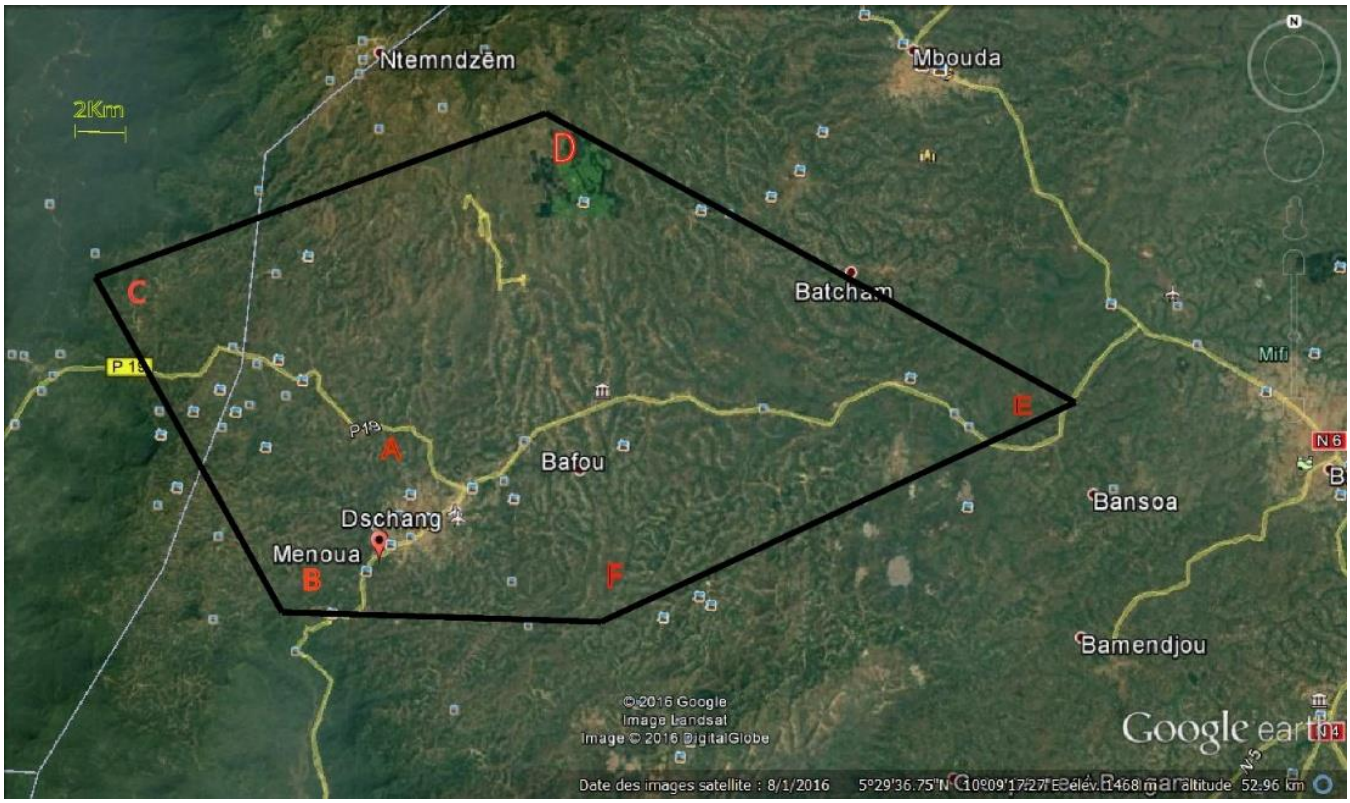

Figure 1 Project Boundary

B.4. Description of the baseline and its development as per the chosen methodology:

In Cameroon no legislation enforces composting of organic waste, collection or combustion of landfill gas. Municipalities[3] are in charge of waste management (see Cameroonian environmental law in annex 19). The prevailing practice (easier and cheaper) in Cameroon implies to collect and burry waste at the solid waste disposal and as a consequence, emissions of large quantities of landfill gas are released directly into the atmosphere.

As mentioned in the City's technical services letter (see Annex 4) without the project, the Municipality would collect this waste and stockpile it in the existing anaerobic conditions of management of SWDS (business as usual). Pictures of the final SWDS are available in Annex 6.

The emission reductions linked to the decrease of chemical fertilizers needs, or to the increase in crop production (CO_2 fixing) thanks to the use of compost are not claimed for.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered micro-scale project activity:

In Cameroon, the majority of cities have a very poor waste management. In Dschang, according to different calculations, between, 20 and 25% of waste are collected. Waste collection is organized in two parts: either pre-collection associations are in charge of waste collection amongst households and transport them to dumpsters or households bring their waste directly to the dumpsters. Collection trucks then transport waste from dumpsters to the waste disposal site.

Waste is dumped in Siteu landfill, which is managed to avoid fires and other problems linked to waste decomposition. Landfilling consists in dumping waste in one place, level it on a regular basis with a bulldozer and leave it to decompose. Landfilling then results in landfill gas production that is emitted into the atmosphere as it is not captured in Dschang. (see Annex 4 and 6 for more details on waste management in Dschang).

The project diverts various organic waste from landfilling towards a composting plant: instead of anaerobic conversion, resulting in methane production, organic waste is degraded in an aerobic manner, producing only non-fossil C02.

The project also emits GHG, though very little. Those emissions come from electricity used for lighting on the platform and eventually for offices, and from the composting process itself. Project emissions are therefore far below baseline emissions.

Demonstration and assessment of additionality:

As per the Methodological Tool Demonstration of additionality of small scale project activities. Tool 21, version 10

Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

[3] Cameronian Environmental law : « Loi n° 96/12 du 5 août 1996 portant loi cadre relative à la gestion de l'environnement » article 46

a) **Investment barrier**: a financially more viable alternative to the project activity would have led to higher emissions;
b) **Technological barrier**: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;
c) **Barrier due to prevailing practice**: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;
d) **Other barriers**: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The composting project in Dschang is additional per the technological barrier.

Demonstration:

The baseline scenario in waste management in Dschang corresponds to collect and burry waste at the solid waste disposal site (see Annex 5 description of the situation by the municipality).

Burying waste is a less advanced technology, leading to higher methane emission (cf Annex 9 VER calculation, baseline scenario leads to 52904 t_{CO2eq} when composting produces 9257 t_{CO2eq}) and involving less financial risk, taking into consideration performance and market share uncertainties of the new technology involving composting

B.6 Emission reductions:

B.6.1. Explanation of methodological options or description of new proposed approach:

Baseline emissions:

According to section 14 (page 15) of the methodology used in the project (AMS III-F / version 12), the baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass solid waste or manure. When wastewater is co-composted, baseline emissions include emissions from wastewater co-composted in the project activity. The yearly Methane Generation Potential for the solid waste is calculated using the first order decay model as described in the latest version of the methodological tool "Emissions from solid waste disposal sites". Baseline emissions from the manure composted are calculated as per the procedures of AMS-III.D.

Baseline emissions shall exclude emissions of methane that would have to be captured, fuelled or flared to comply with national or local safety requirement or legal regulations.

$$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - (MD_{y,reg} * GWP_{CH4})$$

Where:

$BE_{CH4,SWDS,y}$

Yearly Methane Generation Potential for the solid waste composted by the project activity during the years *x* from the beginning of the project activity (*x*=1) up to the year *y* estimated as per the latest

version of the methodological tool "Emissions from solid waste disposal sites" (tCO_2e). The tool may be used with the factor "f=0.1" taking into account the methane oxidation effect by the upper layer of the landfill. With the definition of year *x* as 'the year since the project activity started diverting wastes from landfill disposal, *x* runs from the first year of crediting period (*x*=1) to the year for which emissions are calculated (*x*=*y*)'**$BE_{ww,y}$**

Baseline emissions from the waste water co-composted. *Not applicable* as the current project does not co-compost waster.

$BE_{CH4,manure,y}$

Baseline emissions from manure composted by the project activities. *Not applicable* as no manure is being composted.

$MD_{y,reg} * GWP_{CH4}$

Emissions of methane that would have to be captured fuelled or flared to comply with national or local safety requirement or legal regulations.

Not applicable, as a throughout investigation done on Cameroon's environmental regulation demonstrated that the prevailing legislation at the date of writing the PDD doesn't impose methane capture or combustion. The methane emitted by the SWDS is not captured nor flared.

Presently, there is no regulation regarding waste or SWDS management in Cameroon. The environmental law written on August 5th 1996[4] does not impose any specific kind of waste treatment. As a consequence MD_{reg} is zero.

The GHG sources, sinks and reservoirs for the baseline scenario are only the methane emissions avoided from preventing waste disposal at the solid waste disposal site:

$$BE_y = BE_{CH4,SWDS,y}$$

The equation for $BE_{CH4,SWDS,y}$ according to the methodology is:

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

This equation implies that for waste composted in year x, emission reductions are produced in year x, but also in the following years. Thus, emission reductions in year 5 are the resultant of the waste treated on the five first years of the project. This is not consistent with the actual composting process which avoids methane emissions once waste is treated for the whole lifetime of organic content –if aerobic conditions are well respected throughout the composting process.

In order to better reflect the immediate benefits of the composting activity on the GHG emissions, and as it has been discussed with GS TAC and accepted for a similar project in Togo (GS 1147), the

[4] Cameronian Environmental law : « Loi n° 96/12 du 5 août 1996 portant loi cadre relative à la gestion de l'environnement » Article 50.

Dschang[5] composting project proposes to adapt the formula by affecting emission reduction to the year when the cause of the emission reduction would occur (year of deposit). This can be done directly on the baseline emission calculation.

The adapted formula is as follows:

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

Where:

$W_{j,y}$ = Amount of solid waste type *j* disposed or prevented from disposal in the SWDS in the year *x* (t)

y = Current year of the crediting period for which methane emissions are calculated (y is a consecutive period of 12 months)

Z = Final year considered for methane emissions calculation. Following suggestion by the GS TAC, Z =10 is used.

This is conservative as it neglects the baseline GHG emissions which will be produced in anaerobic conditions after 10 years of waste decomposition.

$$W_{j,x}=W_x \times p_{j,x}$$

Where:

Wj,x = Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x (t)
Wx =Total amount of solid waste disposed or prevented from disposal in the SWDS in year x (t)
$p_{j,x}$ =Average fraction of the waste type j in the waste in year x (weight fraction)
J =Types of solid waste
X =Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

$$p_{j,x} = \frac{\sum_{n=1}^{Z_x} p_{n,j,x}}{Z_x}$$

Where:
pj,x = Average fraction of the waste type j in the waste in year x (weight fraction)
pn,j,x = Fraction of the waste type j in the sample n collected during the year x (weight fraction)
Zx= Number of samples collected during the year x
n = Samples collected in year x
j = Types of solid waste
x = Years in the time period for which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

[5] As initiated in project GS 1147 : Composting of municipal waste in Lome

Project emissions:

According to the Sections 16 to 21 of the AMS III-F methodology v.12, project activity emissions shall be determined as per the latest version of the methodological tool "Project and leakage emissions from composting"., which is the version 01.0.
(Version 01.0.0**).**

In paragraph « Project emissions procedure », the project emissions are defined as follows :

The project emissions from composting ($PE_{comp,y}$) are determined as follows:
:

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

Where

$PE_{EC,y}$ - Project emission from electricity consumption associated with composting in year y:

Those emissions are fully taken into consideration in the current project, taken into account the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" EB 37 annex 7, version 1, 16th May 2008.

$PE_{FC,y}$ - Project emission from fossil fuel consumption associated with composting in year y

Project activity does not use fuel at the moment. There is no back up source of electricity at the project site (no generator) as the composting process is not mechanized. Therefore, those emissions are not accounted for. In case of introduction of an equipment consuming fuel (for example a thermal pump), the corresponding emissions would be introduced in the calculation).

$PE_{CH4,y}$ - Project emissions of methane from the composting process in year y

Those emissions are fully taken into consideration, and calculated both for ex post and ex ante calculation with the default value of the methodology.

$PE_{N2O,y}$ - Project emissions of nitrous oxide from composting process in year y.

Those emissions are fully taken into consideration, and calculated both for ex post and ex ante calculation with the default value of the methodology.

$PE_{RO,y}$ - Project emission of methane from runoff wastewater associated with co-composting.

Run-off waste water is not co-composted. Therefore, those emissions are not accounted for

Leakage emissions:

According to Section 17 and 18 of AMS III F, version 11.0, leakage emissions should be considered only if

the project technology is the equipment transferred from another activity or if the existing equipment is transferred to another activity and/or if the compost is subject to anaerobic storage or disposed of in a SWDS,

Here no leakage should be considered, as

- Neither the project nor the equipment is transferred from another activity.
- The compost is not subject to anaerobic storage or disposed in a SWDS

Description of new proposed approach:

As explained previously (paragraph B.6.1) a deviation from the methodology has been introduced to calculate emissions reductions.

It is suggested to consider emission reduction for when the treatment occurs: for waste treated during year one, is accounted the emission that would have occurred from year one through year ten in year one. See graph hereunder:

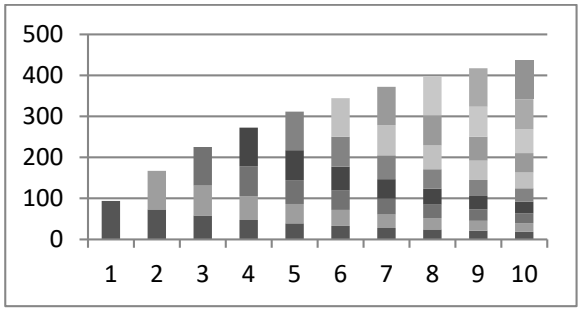

figure 8: X tons of waste composted every year – methodology

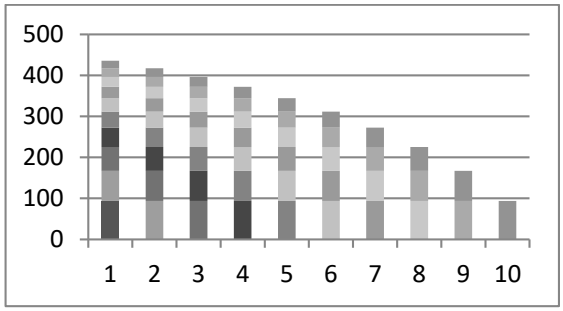

figure 9: X tons of waste composted every year – new proposal

This approach is:

- logical as once waste is composted, it avoids methane emission from waste that would have been left to decay in baseline scenario;
- conservative as for a same amount of waste composted every year it does not change the total amount of emission reduction. In our case, as the treatment capacity increases over the years, the new proposal generates less emission reduction than the methodology.

In our case the emission reductions from the initial approach methodology are as follows:

Year	**Emission reduction**
Year 1	288
Year 2	925
Year 3	1 967
Year 4	3 371
Year 5	4 602
Year 6	5 487
Year 7	6 135
Year 8	6 617
Year 9	6 983
Year 10	7 267
Total reduction emission	**43 646**
Average annual reduction emission	**4 364**

The proposed approach reorganizes the emission reduction as follows:

Year	Emission reduction
Year 1	1 531
Year 2	2 978
Year 3	5 055
Year 4	6 933
Year 5	6 557
Year 6	6 061
Year 7	5 396
Year 8	4 485
Year 9	3 218
Year 10	1 432
Total reduction emission	**43 646**
Average annual reduction emission	**4 365**

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Value applied:	0.85
Justification of the choice of data or description of measurement methods and procedures actually applied:	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).
Any comment:	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects.

Data / Parameter:	**Ox**
Data 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 used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Any comment:	

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Any comment:	

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to the CDM "Methodological tool: Emissions from solid waste disposal sites" Version 08
Any comment:	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

Data / Parameter:	**MCF**
Data unit:	-
Description:	Methane correction factor

Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied:	According to "Methodological tool: Emissions from solid waste disposal sites" Version 08". The water table is at least 11 meters deep[6] 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.
Any comment:	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

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	
Justification of the choice of data or description of measurement methods and	According to CDM "According to "Methodological tool: Emissions from solid waste disposal sites" Version 08"

Waste type j	**DOC_j (% wet waste)**
Wood and wood products	43
Pulp, paper and cardboard (other than sludge)	40
Food, food waste beverages and tobacco (other than sludge)	15
Textiles	24
Garden, yard and park waste	20
Glass, plastic, metal and other inerts	0

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

procedures actually applied:	
Any comment:	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 millimeters seems to be mostly organic matter thus they are assimilated to food waste.

Data / Parameter:	k_j
Data unit:	1/year
Description:	Decay rate for the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	See nested table below
Justification of the choice of data or description of measurement methods and procedures actually applied:	Climatic conditions in Dschang correspond to a tropical zone, with mean annual temperature >20°C and mean annual precipitation >1000mm.
Any comment:	Cf Annex 7 for climatic data.

Waste type j		Weather wet and tropical
Slowly degrading	Pulp, paper and cardboard (other than sludge), textiles	0.07
	Wood and wood products and straw	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.17
Rapidly degrading	Food, food waste, sewage sludge, beverages and tobacco	0.40

Data / Parameter:	EF_{power}
Data unit:	t_{CO2}/MWh
Description:	Emission factor for grid electricity
Source of data used:	"Tool to calculate baseline, project and/or leakage emissions from electricity consumption" EB 39 Annex 7 May 16th 2008
Value applied:	1.3
Justification of the choice of data or description of measurement methods and procedures actually applied:	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.
Any comment:	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 will then be monitored through the electricity meter and the periodic invoices of the distribution company

Data / Parameter:	$EF_{CH4,default}$
Data unit:	t_{CH4}/T
Description:	Default emission factor of methane per ton of waste composted (wet basis)
Source of data used:	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 applied:	0.002
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	$EF_{N2O,default}$
Data unit:	t_{N2O}/T
Description:	Default emission factor of methane per ton of waste composted (wet basis)
Source of data used:	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 applied:	0.0002
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	t_{CO2e}/t_{CH4}
Description:	Global warming potential of CH4
Source of data used:	IPCC Fourth Assessment Report: Climate Change 2007 (See www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14)
Value applied:	25
Justification of the choice of data or description of measurement methods and procedures actually applied:	

Any comment:	

Data / Parameter:	**GWP_{N2O}**
Data unit:	t_{CO2e}/t_{N2O}
Description:	Global warming potential of N2O
Source of data used:	IPCC Fourth Assessment Report: Climate Change 2007 (See www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14)
Value applied:	298
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

Calculation of Baseline GHG emissions

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 follows:

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

Where:

$BE_{CH4,SWDS,y}$	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} = 25 Monitored
F	Fraction of methane in the SWDS gas (volume fraction)	F = 0,5
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose	DOC_f = 0,5
MCF	Methane correction factor	MCF = 1
$W_{j,y}$	Amount of organic waste type j prevented from disposal in the SWDS in the year y (tons). See Annex 10 for sources and waste characterisation	Calculated from two monitored parameters: Total amount of organic waste prevented from disposal and Weight fraction of the waste type j
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type j.	Wood: 43 Pulp, paper: 40 Food waste: 15 Textiles: 24 Garden waste: 20 Inert waste : 0
k_j	Decay rate for the waste type j	Wood: 0.025 Pulp. paper: 0.045 Food waste: 0.085 Textiles: 0.045 Garden waste: 0.065 Inert waste : 0
j	Waste type category	
x	Years in the time period in which waste is disposed at the SWDS	x runs from the first year in the time period (x = 1) to year z (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*25*(1-0)*16/12*0.5*0.5*1 = 6.375

The formula then becomes:

$$BE_{CH_4,SWDS,x} = 6.375 \sum_{x}^{Z} \sum_{j} W_{j,y}.DOC_j.e^{-k_j.(Z-x)}.(1-e^{-k_j})$$

Calculation of GHG emissions and/or removals for the project

As explained in paragraph B.6.1, the project GHG emissions are coming from three sources:

- CO_2 emissions on account of electricity used by the project activity facilities for screening and mechanical sorting out of compost.
- Methane emissions during composting process
- 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

Calculated with the "tool to calculate baseline, project and/or leakage emissions from electricity consumption" EB 37 annex 7 version 1, 16th May 2008:

$$PE_{EC,y} = EE_y * EF_{CO2} * (1+ TDL)$$

Where

EE_y	Electrical energy consumption in the year y (kWh)	Monitored data
EF_{CO2}	CO_2 emission factor from electricity produced from fossil fuel	EF_{CO2} = 1.3 kg CO2e/kWh default value from the tool
TDL	Average technical transmission and distribution losses for providing electricity to source *j* in year *y*	0.2 default value from the tool

Methane emissions during composting process

Methane emissions are calculated with the default values from the tool to determine "project and leakage emission from composting" versions 01.0.0, as the monitoring method is too expensive for a project of this size.

$$PE_{CH4,y} = Q_y * EF_{CH4,y} * GWP_{CH4}$$

Where

Q_y	Quantity of waste composted in year y (t/yr)	Monitored data
$EF_{CH4,y}$	Emission factor of methane per tonne of waste composted valid for year y (t CH4 / t)	$EF_{CH4,y}$ = 0.002 t CH4 /t
GWP_{CH4}	Global warming potential of CH4 (TCO2e/t CH4)	GWP_{CH4} = 25

Nitrous oxide emissions during composting process

Nitrous Oxide emissions are calculated with the default values from the tool to determine "project and leakage emission from composting" versions 01.0.0, as the monitoring method is too expensive for a project of this size.

$$PE_{N2O,y} = Q_y * EF_{N2O,y} * GWP_{N2O}$$

Where

Q_y	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)	$EF_{N2O,y}$ = 0.0002 t N2O /t
GWP_{N2O}	Global warming potential of N2O (TCO2e/t N2O)	GWP_{N2O} = 298

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emission (tCO_2)	Estimation of baseline emissions (tCO_2)	Estimation of leakage (tCO_2)	Estimation of overall emission reductions (tCO_2)
Year 1	220	1 752	N/A	1 531
Year 2	450	3 429	N/A	2 978
Year 3	782	5 838	N/A	5 055
Year 4	1 114	8 048	N/A	6 933
Year 5	1 114	7 672	N/A	6 557
Year 6	1 114	7 176	N/A	6 061
Year 7	1 114	6 510	N/A	5 396
Year 8	1 114	5 599	N/A	4 485
Year 9	1 114	4 333	N/A	3 218
Year 10	1 114	2 547	N/A	1 432
Total (tCO_2)	**9 257**	**52 904**	**N/A**	**43 646**

Also see Annex 8 for the full calculation sheet.

B.7 Application of a monitoring methodology and description of the monitoring plan as per the existing or new methodology applied to the micro-scale project activity:

B.7.1 Data and parameters monitored:

Data / Parameter:	**f_y**
Data unit:	
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane into the atmosphere in year *y*.
Source of data to be used:	Historical data on the amount captured on the SWDS by the municipality or the entity managing the SWDS
Value of data	0
Description of measurement methods and procedures to be applied, inc. frequency:	Visually. A yearly visit to the final solid waste disposal site will be done by the person in charge of monitoring, in order to check whether any methane capture or flaring system has been installed on the SWDS, and the corresponding fraction of methane captured.
QA/QC procedures to be applied:	
Any comment:	There is no capture / combustion of gas at the solid waste disposal site at the time of writing the PDD and the municipality doesn't has it as a project.

Data / Parameter:	**W_x**
Data unit:	tons
Description:	**Total** amount of organic waste prevented from disposal in year x equal to all organic waste treated by ERA Cameroun (market, domestic, fruit bunches, other waste such as biowaste) as per the tool "Emissions from solid waste disposal sites".
Source of data to be used:	Measurements by ERA Cameroun
Value of data	1st year: 2 000 tons

	2nd year: 4 000 tons 3rd year: 7 000 tons 4th year and after: 10 000 tons For details see table A.3.2
Description of measurement methods and procedures to be applied, inc. frequency:	The methodological tool "project and leakage emissions from composting" v. 1.0 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 (manual sorting, see & A3.2, figure 3) 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. Both flows are calculated with the exact number of wheelbarrows exhaustively counted on each site every day and on the basis of the evaluation of the carrying capacity of a wheelbarrow. The average carrying capacity of the wheelbarrows is defined for each flow twice a year (one in dry season and one in wet season) on the basis of a mean of ten (10) measurements of the carrying capacity of the wheelbarrows. The carrying capacity is determined thanks to the balance available on the site, which is calibrated according to the legal local regulations. Such procedure allows a much better accuracy of the total amount of organic waste delivered to the composting installations (Siteu and Ngui).
QA/QC procedures to be applied:	Such parameter will be cross-checked through the available records of municipality waste collected quantities.

Any comment:	

Data / Parameter:	**$P_{n,j,x}$**
Data unit:	%
Description:	Weight fraction of the waste type j in the sample n collected during the year x
Source of data to be used:	Characterization of raw waste made by ERA Cameroun in 2014 - 2015 for ex-ante calculation. The figure used are the mean of 6 different characterization done in September 2014 and from January to May 2015. For ex-post please see here under "description of measurement …"
Value of data	Household waste - Wood and wood products: 1.1% Paper and cardboard: 4.9% Food and food waste: 68.7% Textiles: 4.4% Yard and garden waste: 12.1% Inerts: 8.9%
Description of measurement methods and procedures to be applied, inc. frequency:	A characterization will be done three times every three months by ERA Cameroun according to the characterization protocol on incoming waste (composed by the six types of waste described by the methodology). Such frequency is in conformity with the with the specifications of the tool requesting a minimum of three samples every three month
QA/QC procedures to be applied:	Such measurement method is based on the NF X30-408 and NF XP X30-466 standards.
Any comment:	The sampling size was calculated with the software Echant® so that the sampling has 95 % confidence with 10% precision. More details in Annex 11: Sampling plan. The ex-ante calculation is based on the average of the last 6 characterizations done on the pilot-phase and beginning of the project (see Annex 10)

Data / Parameter:	**$Q_{y,treatment}$**
Data unit:	tons
Description:	Quantity of compost produced in year y
Source of data to be used:	ERA's recording

Value of data	1st year: 360 tons 2nd year: 720 tons 3rd year: 1 260 tons 4th year and after : 1 800 tons
Description of measurement methods and procedures to be applied, inc. frequency:	Continuous measurement. After being screened, the compost is stored and packaged into 50kg bags ready for sale. Quantity of bags filled in is recorded on the platform.
QA/QC procedures to be applied:	Data is cross-checked with both sales record and process analysis. (see "any comment").
Any comment:	For the ex-ante calculation, the analysis of the process was used: in January 2014 it was estimated that the production yield (ratio between compost production and quantity of waste treated) was around 18%. Such rate was used for the entire calculation.

Data / Parameter:	**E_y**
Data unit:	Kwh
Description:	Electrical energy consumption for compost production in year y.
Source of data to be used:	Electricity meter.
Value of data	1st year : 1MWh 2nd year : 8MWh 3rd year: 10MWh 4th year and following : 12MWh
Description of measurement methods and procedures to be applied, inc. frequency:	The definition of data is based on the electric motors in the plant. The increase of domestic waste treatment capacity will be followed by a proportional increase of electric power, which is conservative.
QA/QC procedures to be applied:	The actual energy consumption will be monitored through the electricity meter and cross-checked with the distribution company invoices.

Any comment:	The ex-ante calculation was done using estimation over the years with a scenario of an increased number of electricity powered machines. Note that as the process, in 2015 is not mechanized so far., the main future use of electricity would be for light (but activity is mainly during the day) and Some machinery may be brought later on but only for some specific steps (as employment is one of the main goal of the project), Therefore when a problem would occur with the electricity provider, the compost production would be able to go on anyway.

Data / Parameter:	**Compost application**
Data unit:	/
Description:	This parameter is to ensure aerobic application of compost. It will be checked through on site visits with a sample of clients.
Source of data to be used:	ERA's commercial visits record. Sales and delivery record
Value of data	
Description of measurement methods and procedures to be applied, inc. frequency:	Sheets of good practices on the use of compost (written in French) will be drafted, discussed and made available to users. They will include recommendations to avoid burying compost deeper than 50cm or in water saturated soils.
QA/QC procedures to be applied:	Sales visits will be done twice a year to the main clients. The aerobic conditions in soil application will be verified during those visits. Those visits will mainly be done by the commercial team, but it may also be supported by the agronomic expert when necessary. In order to follow the buyers, sales records are part of the monitoring plan, as well as delivery record. They will include the type of cultures on which compost is applied. At least one third of the total weight of compost applications will be controlled.
Any comment:	

B.7.2 Description of the monitoring plan:

The monitoring plan (MP) defines a standard, according to which, the performance in terms of VERs will be monitored and verified, in conformity with all relevant requirements of the CDM of the Kyoto Protocol. This MP will become an integral part of the Operational Manual. It will be subjected to verification procedure. The full document as it appears in ERA's Operational Manual is available in Annex 9. As it explains all the calculations, the few points that were not detailed above would appear in this part.

The aerobic conditions of composting are ensured through the verifications by temperature measures that the process is exothermic, and then realized in aerobic conditions.

Compiling, analyzing and recording data and information

The necessary data for quantifying and reporting GHG emissions and/or removals are continuously collected in the recording forms. The recording forms templates are given in Annex 9 of the present document.

Monitoring excel sheet

Those different sheets allow the person in charge of monitoring to collect all data necessary to calculate actual Emission reductions and to write the monitoring report. The data collection is done on a monthly basis, and directly compiled into the excel sheet so as to store information in a daily notebook for verification and in the monitoring responsible computer. At the same time the project manager compiles the same data in a different manner so as to make it possible to cross-check data.

For more details on the sampling, see Annex 11: sampling plan.

B.8 Date of completion of the application of the existing or new baseline and monitoring methodology and name of the responsible person(s)/entity(ies)

The baseline and monitoring methodology were completed in August 2014 by the project partners:

- Gevalor (Gaïa Ludington, Morgan Souriau)
- ERA Cameroon (Charcot Djokam / Joel Sagne)

On ERA Cameroun's board the person in charge of monitoring is also the production manager. The project manager, who writes the monthly report, helps to cross-check the data.

They will benefit from Gevalor help, especially at the beginning of the project for monitoring reports writing.

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

31/12/2014

This date was chosen because the financing agreement between EU and Dschang Municipality was signed on December 31st 2014 (see annex 21), making it possible to invest and start compost production at a large scale in 2015.

C.1.2. Expected operational lifetime of the project activity:

The project activity will last for ten years. The project should be able in ten years to finance itself without the help of carbon finance.

C.2	Choice of the crediting period and related information:

C.2.1.	Renewable crediting period

C.2.1.1.	Starting date of the first crediting period:

01/01/2015 or two years back from the end date of the 6 weeks registration review period, whichever is later.

C.2.1.2.	Length of the first crediting period:

>>

C.2.2.	Fixed crediting period:

C.2.2.1.	Starting date:

31/12/2014

C.2.2.2.	Length:

Ten years

SECTION D.	Stakeholders' comments

D.1.	Brief description how comments by local stakeholders have been invited and compiled:

Before the meeting

Invitation letters with non-technical summary were sent to various administrations, local and international NGO's, local officials, local and international GS supporter NGO's, neighbors, workers and groups of farmers. The same invitation and non-technical summary were stick up in various places such as the city council announcement plateau, the tourism office, the market, in the neighborhood which makes a total of 31 written announcements stuck up. Five announcements on three different local radios were also done a week before the meeting and several times during the days just before the meeting. Such documents (the invitation, the non-technical summary, pictures of the invitation stuck up, the list of radio announcements, and the list to keep track of invitations) can be found in Annex 12 (invitation and non-technical summary) and Annex 12b. (invitation track, pictures of the invitation stuck up, the list of radio announcements, pictures of the meeting).

During the meeting

114 persons attended this local stakeholder's consultation (see list in Annex 12c) with a large diversity in gender, ethnicity and educational level.

After a presentation of the project with a PowerPoint document, a session of questions and answers was opened. All the questions were answered at best; the ones which could not be answered on the spot were answered with the stakeholders' consultation feedback round. At the end of the meeting stakeholders were invited to fill in an evaluation form. The blank evaluation form can be found in annex 13; comments of the stakeholders are summarized hereafter. **After the meeting**

After the meeting, a visit of Ngui composting site was proposed in the afternoon for those who wish to go, guided with technical staff of ERA.

Stakeholders –among whom those invited to the stakeholders' consultation- were invited to participate to a feedback round (see paragraph D.4).

D.2. Summary of the comments received:

Meeting:

Place: "Salle des Actes" City council, Dschang.

Date: December 10th 2014 from 10:30 AM to 13:30 PM

Number of participants: 114 persons

After the hosts got installed, the Mayor of Dschang welcomed everybody to this information and consultation meeting around the composting platform managed by ERA Cameroun.

Africompost's delegate, ERA Cameroun's delegate, as well as the environment, nature protection and sustainable development ministry delegate introduced themselves and their role in the project.

The presentations below were made, in the following order:

Dr Emile Temgoua, first mayor deputy ad member of ERA Cameroun presented the history, the context and the objectives of the project.

Miss Nadège Cheugue, project's intern, presented the social and environmental risks associated with the project.

To end up, Miss Gaïa Ludington, Technical manager for Gevalor, introduced carbon finance.

The PowerPoint presentation as it was presented during the meeting can be found in Annex 14 (in local language: French). The presentation in itself lasted around 30 minutes.

Then, the session of questions and answers was opened. It lasted for over two hours.

Here are translated only the most interesting comments, and answers given. The entire report in French is available Annex 15.

Questions / Answers	
Question / Comment	Answer
ASONTSAAG Charles: Is waste sorting planned in the production process? I mean, sorting done by households, before collection, in order to reduce the size of the shed for the project	**The mayor** *Household sorting wasn't the selected option at the beginning of the project. The choice was made of sorting waste after collection, when it gets at the platform. This way, sorting out is adapted for composting realities.* **1st deputy mayor** *Waste sorting hasn't started yet due to lack of didactic material. In order to start waste sorting, the municipality should be able to give the population the three colored bins, which isn't possible at the time.* *Though, we do plan to start household waste sorting soon with a pilot project, which will take place in "Fiankop II" neighborhood.*
DJIATSA Crovice B. : The composting project brings high preoccupation for Ngui inhabitants and for the closest neighbors in particular. Since the project started, there are many mosquitos, the smell is very important, and the road is covered by waste, particularly during the rainy season. It should be thought of building the new shed further from the road, as well as the water drainage and give away mosquito nets and bug killers.	**The mayor** *Concerning the roads, it's a subject of high preoccupation for the Municipality. Collection of the platform refuses started last week and work will be done during dry season order for the platform to be accessible thus refuses collected along with their production.* *For the smell, work will be done on the production process to minimize them, as the Environment Ministry deputy said it.* **1st deputy Mayor** *Theoretically composting shouldn't produce any smell, it's non treated waste producing the smell, having a more regular collection should take care of the problem.* **Gevalor's local technical support** *With the new dispositions, incoming waste should be treated on the day they get to the platform. Composting will be done under a new shed, thanks to new financial and material mean. Thus smell will disappear by itself as it's the non-composted waste which smells and not the composting process.*

DELOKO Jean I want to inform all people at the meeting, that the neighborhood "Fiankop II" already does individual recycling and composting.	**1st deputy mayor** *We take note and congratulate those people. It is a first step to household waste sorting.*
ADJOUTABA M. Evrard (student CIFADDEG) Is the dump a controlled dump as you said it earlier? Is there a recuperation system for liquids and gases? Are there de-rat and desinsect campaigns? How is the treatment of dangerous waste done ?	**1er deputy mayor** *Siteu's dump is a controlled dump. The experts studied and it was designed with a waterproofed cell on the basis and a plan of pipes to evacuate leachates. Furthermore, it is necessary to know that at seven (7) meters depth, the soil is clayey and lateritic. This property of the soil does not allow the infiltration of effluents in the ground. The designers of the dump thus took into account not to dig beyond seven (7) meters. The groundwater situated at twenty (20) meters depth is not normally polluted. A municipal guard is also allocated to the dump to manage the access to the site. A controlled dump is also a site having a barrier, and numerous other elements. At the time it's not exactly the case, though it's hoped to be able to correct that with new financial means.* *You must know also that it' not worthy to do biogas as well as compost on a dump site, as composting prevents methane production, whereas if you want to flare dump gases, you need methane production. In particular studies were done here in Dschang, showing the impossibility to make the investment worthy.* *About dangerous waste, especially hospital waste, they don't go to the dump. Only household waste is burried in Siteu's dump.* **NGUEGANG Etienne (Ministry's deputy)** *The guard insures waste origin in order to make sure that no dangerous waste is brought. Health centers are supposed to treat their own waste and are not allowed to send their waste to the dumpsite.* *At the SWDS, waste are regularly covered with soil to limit smell and insects proliferation.* *There is no need to capture dump gases as we will be composting organic waste. The little methane left cannot be collected in a cost and technical effective way.*
NDONGMON. Beaudelin, Permanent Secretary of AME (NGO representative)	**NGUEGANG Etienne (Ministry's deputy)**

The water resource has to be protected and preserved, what is planned in order to protect water resources and avoid pollution?	*Each landfill cell shall be waterproofed, for example with white clay, but in Dschang the groundwater is 20m deep, and the ground is out of laterite, which is enough waterproofed to avoid leachates infiltration.*
TSINGAP Marcel (population representative Ngui) The composting site exists, and should continue existing. We never asked that it stopped its activities, but what we want are some accompanying measures: we want youth to be prioritized for employment on the site.	**The mayor** *Ngui's site will continue existing. For sure. It was never thought of closing it. This site is going to be dimensioned, bigger, and more effective. Let's not forget that this pilot site is at origin of the bigger project for which we are here together today.*

The stakeholders were then invited to fill up the evaluation form and once the meeting was closed (around 1.30 PM), a meal was offered by ERA and the municipality.

The following table summarizes the content of the evaluation forms.

Report on the evaluation forms:

78 evaluations forms were both filled in and understandable.

Participants thoughts on the meeting	
Positive	**Negative**
✓ Good understanding of the project ✓ Very interesting meeting, especially for the farmers ✓ **Very satisfied – interesting - needed** ✓ Information on project's reality ✓ Good idea, which reassure population concerning the participative management. ✓ Instructive – educative very clear –very interesting debate	✓ No paper to take notes ✓ Started late – too long – very bad ✓ Give away to participant's technical information on composting, especially to farmers.

Project advantages	**Project drawbacks**
✓ Transforming waste into compost ✓ Taking away waste from population	✓ Ngui composting platform is too close from the school and houses.

✓ Increases the city's waste collection capacity ✓ Reduce youth unemployment rates ✓ Makes the city clean ✓ Waste treatment ✓ Reduces chemical fertilizer use. ✓ Facilitates good production for cultures. ✓ Improves economic development of the city ✓ Jobs creation ✓ Improves food security through organic agriculture, thanks to compost ✓ Sanitizes the environment ✓ Reasonable cost for the compost ✓ Unofficial waste disposal site are disappearing thus the property of the city is acquired. ✓ Compost is the one economic mean which allows farmers to amend their ground and fertilize their cultures in order to have better efficiency, in term of quality and quantity. ✓ Greenhouse gases reduction ✓ Production of organic fertilizer ✓ Compost stays a long time in the soil. ✓ Cost less and better efficiency for the cultures. ✓ The project will ease compost and VER valorization ✓ Use of green fertilizer instead of very expensive chemical fertilizer. ✓ Attempts to improve negative social and environmental impacts ✓ Ground structure improving ✓ Improving population's health and means of living. ✓ A project which shows a nice future, but still a lot of work. ✓ The project is a great innovation for the City of Dschang.	✓ Bad smells, flees, mosquitos that bring malaria. ✓ Waste collection is not regular in all neighborhoods ✓ The fact that sensitizing the population to waste sorting at household level is not part of the project. ✓ The methods allowing the reduction of negative impacts don't seem very efficient. ✓ The negative impacts presentation wa too short, there is a risk of water contamination. ✓ Very little quantity of compost available. ✓ Improve quantity treated ✓ Bad pricing for compost ✓ Need to create selling points. ✓ Fragile population not taken into account ✓ Need to create water abduction point. ✓ Inability to cover farmers need ✓ No financial motivation for people sensitizing to compost utilization.

D.3. Report on how due account was taken of any comments received and on measures taken to address concerns raised:

Here is a sample of the comments and suggestions received and answers given. (All comments and answers can be found in French Annex 15)

Comments / Suggestions	Answers
Is it possible to control those inconvenience or otherwise move the site towards the suburbs of the city?	*Moving the platform would be difficult as it treats waste from neighbors.* *Controlling nuisances though is possible, measures are being taken and are going to be implemented to eradicate them, or at least limit them.*
Improve the two platforms and capture SWDS gases.	*Capture gas on a composting platform is not worthy as composting prevents methane production.*
Distribution of mosquito nets, bug killers, products against malaria	*It won't be possible to answer positively to those requests, partly because of their cost. The project wants to remind Ngui inhabitants that the area is a swamp, and that the probability that composting bring mosquito is very low. On the contrary, by treating all the waste at their arrival, and by draining rain water, the number of mosquitos should reduce.*
Add waste containers in the city.	*Taking into account the limited number of containers available, strategic places are being localized to dispose the containers.*
Collect waste in all the city neighborhoods.	*Some neighborhoods not accessible for trucks are collected with moto-tricycles. The extension will be done little by little. Nevertheless, for enclaved neighborhoods, we shall recommend doing individual composting, and bring the rest of the waste to collection grouping points.*
Please use the local radios to communicate on the project	*It's something that the project already does, and will try to improve our message. (radio Yemba and Nguiéla'àà)*
Build hospitals	*This action cannot be carried out by the project. Though a first aid box is available on the platform for the agents. Another one will be available on the second platform.*
Look for more donors.	*Of course, looking for more co-donors will be part of the job for some actions. Though the objective of the project is to be financially and institutionally sustainable after four years.*
This project should be as effective on field as on the paper. People employed should be neighbors at 80%.	*Operators hired will be, at equivalent quality, preferably neighbors from Nguis or Siteus neighborhood.*

Find a sanction for those who throw their waste on the ground instead of in the bins.	*Comment well taken into account.*
Put in place paying pre-collection service	*This action is going to start in Fiankop II and will be generalized as soon as possible.*
Employ young people as much as possible	*Comment well taken into account*
Maximize the production chain and reduce selling prices of compost.	*Reducing the price is not doable as the actual price, 2000 FCFA, is highly sponsored. In comparison, the agronomic value of a compost bag is 3000FCFA, and its production cost 8000FCFA.*
Sort out waste to increase refuses reduction so as compost can be well decomposed and rich in organic matter.	*The sorting out process is constantly analyzed in order to improve it as much as possible.*
Cover the site in order to reduce leachates production.	*Sheds are under construction both in Ngui and Siteu to dramatically reduce the quantity of water going through compost.*
Plant fences around the site.	*Fences will be planted around the two production sites.*

Remarks that come a lot on the project are on waste management in general: pre-collection and collection, which is hopefully going to improve along with the composting project. We can note the population is very demanding on a better service and is open to paying.

Also neighbors think that the project brought mosquitos and other bugs in the surroundings, whereas the land was previously a swamp. A lot of communication and sensitizing is going to be done, in order to make the project and the neighbors coexist.

What also came out is that stakeholders are demanding on information, and on answers to their question. Meetings such as this one need to be reconducted.

D.4. Report on the Continuous input / grievance mechanism:

	Method Chosen (include all known details e.g. location of book, phone, number, identity of mediator)	**Justification**
Continuous Input / Grievance Expression Process Book	A suggestion box is available on Ngui's platform as well as a process book. Both will also be available on Siteu's platform. The project office, situated in the municipality's building is open to visitors. Office Adress : Composting Project, Annexe de la Mairie de Dschang, Face au tribunal (face aux terrains de tennis), B.P. 169, DSCHANG Tél : 99.65.61.04	The box is preferred by neighbors as they can take the time to write their grievance back home, before coming and depositing it. The book is preferred by visitors, to give an opinion after a visit. Neighbors, and other stakeholders go easily to the municipality. The project office is indicated, so as it's easy to find it and go talk directly with the project coordinator. Also, clients or neighbors going to the platform can be redirected to the office if needed.
Telephone access	The project doesn't have a land line, though cellphone numbers of project members are widely communicated.	Landlines are not much used in Cameroon, but cellphones are. The production manager, as well as the commercial and the project coordinator give away their number easily and can be called anytime.
Internet/email access	The project address is compostdschang@gmail.com	The address is communicated, though until now hasn't been much used by stakeholders.
Nominated Independent Mediator (optional)	None	

Gold Standard Foundation	**The Gold Standard Foundation** - Chemin de Balexert 7-9 1219 Châtelaine International Environment House 2 Geneva, Switzerland help@goldstandard.org Tel : +41 (0) 22 788 7080	

D.5. Report on stakeholder consultation feedback round:

The feedback round process intends to receive further inputs on the project. It has been organized from 23/01/2015 to 23/03/2015 as follows:

The report of the meeting was made available during 2 months at the project office, stakeholders were informed by text message (94 text messages sent) that they could come and get it: 11 persons came to the office to get a paper version,

An electronic version of the stakeholder consultation report was sent to stakeholders who gave an email address. 54 emails were sent.

No comment has been received at the date of writing the PDD, though everybody is welcome to do it at any time (see § D4 above).

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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