# BAITANG AONONG SWINE FARM COMPOSTING PROJECT

Document Prepared by Baineng New Energy (Shen Zhen) Co., Ltd

Contact Information

| | |
|---|---|
| **Project Title** | Baitang Aonong Swine Farm Composting Project |
| **Version** | 01 |
| **Date of Issue** | 01-02-2023 |
| **Prepared By** | Baineng New Energy (Shen Zhen) Co., Ltd. |
| **Contact** | Physical address: Room 302, No.2815 Longteng Avenue, Shanghai<br>Telephone: +86 13916000152<br>Email: project@cypressenergy.cn |

# CONTENTS

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

Baitang Aonong Swine Farm Composting Project (hereinafter as “the project”) employs aerobic composting systems on swine farms in Xinzhou Town Huangping county, Guizhou Province, China. The avoidance of methane emissions could be achieved with treatments of aerobic composting, which replaces the baseline scenario where the swine manure would undergo an anaerobic decomposition conditions.

In absence of the project, all manure waste produced was left to decay in uncovered anaerobic lagoons, which is the most economic, viable and reasonable for livestock farm owners.

In this project, the collected swine manure will be utilized through a fermentation composting process. After the fermentation, both solids and wastewater are then treated by a fertilizer production system, of which can produce organic fertilizers used for application to lands. Without this project, the farms in project areas remain conditions of uncovered anaerobic lagoons that may bring a larger amount of GHG emissions sent to the atmosphere.

During the implementation of the project, it is estimated that about 13000 tons of Swine would be treated and composted, with84594 tons of organic fertilizer generated per year. Besides, the GHG emissions is expected to reduce 59,776 tCO2e per year and 597,758 tCO2e in a 10-year crediting period.

## 1.2 Sectoral Scope and Project Type

The project falls under Sectoral Scope 13, “Waste handling and disposal” and Sectoral Scope 15, “Livestock and manure management”.The project is not a grouped project..

## 1.3 Project Eligibility

The project achieve avoiding GHG emissions from uncovered anaerobic lagoons by using aerobic composting system and treatment of both solids and wastewater, which is eligible under the scope of the VCS program and meets the requirement of applied methodology..

## 1.4 Project Design

The project is designed to include multiple project activity instances, but is not being developed as a grouped project

### Eligibility Criteria

The project is not a grouped project..

## 1.5 Project Proponent

| | |
|---|---|
| Organization name | Guizhou Aonong Qihuan Animal Husbandry Co., Ltd |
| Contact person | Xiaomin Long |
| Title | Project Manager |
| Address | Baitang Village, Xinzhou Town, Huangping County, Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province ,China |
| Telephone | 0855-2327977 |
| Email | 2327977@qq.com |

## 1.6 Other Entities Involved in the Project

| | |
|---|---|
| Organization name | Beijing Huayuan Carbon and Environmental Protection Technology Co., Ltd. |
| Role in the project | Consultant |
| Contact person | Liangliang Wang |
| Title | Project Manager |
| Address | Room 2032, Floor 2, Building 1, No. 4, West Matou Village, Tongzhou District, Beijing,China |
| Telephone | +86 19943777575 |
| Email | 15911077662@163.com |

| | |
|---|---|
| Organization name | Baineng New Energy （Shenzhen） Co.,Ltd. |
| Role in the project | VCS buyer |
| Contact person | Zexu Zhang |
| Title | Project Manager |

| | |
|---|---|
| **Address** | Room 302, No.2815 Longteng Avenue, Shanghai |
| **Telephone** | +86 15623507976 |
| **Email** | project@cypressenergy.cn |

## 1.7 Ownership

The project is owned by Guizhou Aonong Qihuan Animal Husbandry Co., Ltd (hereinafter as "Aonong" or "the project proponent"), who has the legal right to operate the project activities. The project approval, approval of Environmental Impact Assessment (EIA), and the business license of the project owner are evidence of legislative rights. Besides, the equipment purchasing contract and the construction contracts are evidence for the plant and equipment ownership.

## 1.8 Project Start Date

As per Section 3.7.1 of VCS Standard (Version 4.3), the project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals. Accordingly, the start date of the project was on 01-August-2021. It is the date when farms started the treatment and processing of solids from manure, as well as the earliest date started generating emission reductions..

## 1.9 Project Crediting Period

The project crediting period is from 01-August-2021 to 30-July-2031 (both days included), with a total of 10 years fixed

## 1.10 Project Scale and Estimated GHG Emission Reductions or Removals

| **Project Scale** | |
|---|---|
| Project | √ |
| Large project | |

| **Year** | **Estimated GHG emission reductions or removals ($tCO_2e$)** |
|---|---|

| | |
|---|---|
| 2021 | 34,967 |
| 2022 | 40,926 |
| 2023 | 46,710 |
| 2024 | 52,322 |
| 2025 | 57,768 |
| 2026 | 63,053 |
| 2027 | 68,183 |
| 2028 | 73,160 |
| 2029 | 77,991 |
| 2030 | 82,678 |
| **Total estimated ERs** | 597,758 |
| **Total number of crediting years** | 10 |
| **Average annual ERs** | 59,776 |

## 1.11 Description of the Project Activity

The project activity is designed to install a set of organic fertilizers production lines to treat the manure from swine farm and the biomass waste residue (straw) in Huangping county Guizhou Province to produce organic fertilizer. This project comprises of fermentation system and fertilizer production system. This project uses microbial aerobic fermentation technology, which follows a step-by-step method as given below:

The first step of fermentation process: manure is mixed with straw or fungus residue, and then added to fermenter tank for fermentation operation: heating to 70-90 degrees in the fermenter, adding strains at the same time during the heating process for stirring operation, stirring inside The temperature of the contents is uniform, killing harmful bacteria and insect eggs. After heating for a period of time, the power is off, and the fermentation biological heat energy is maintained 70-90 Degrees, after 12-24 hours empty the tank;

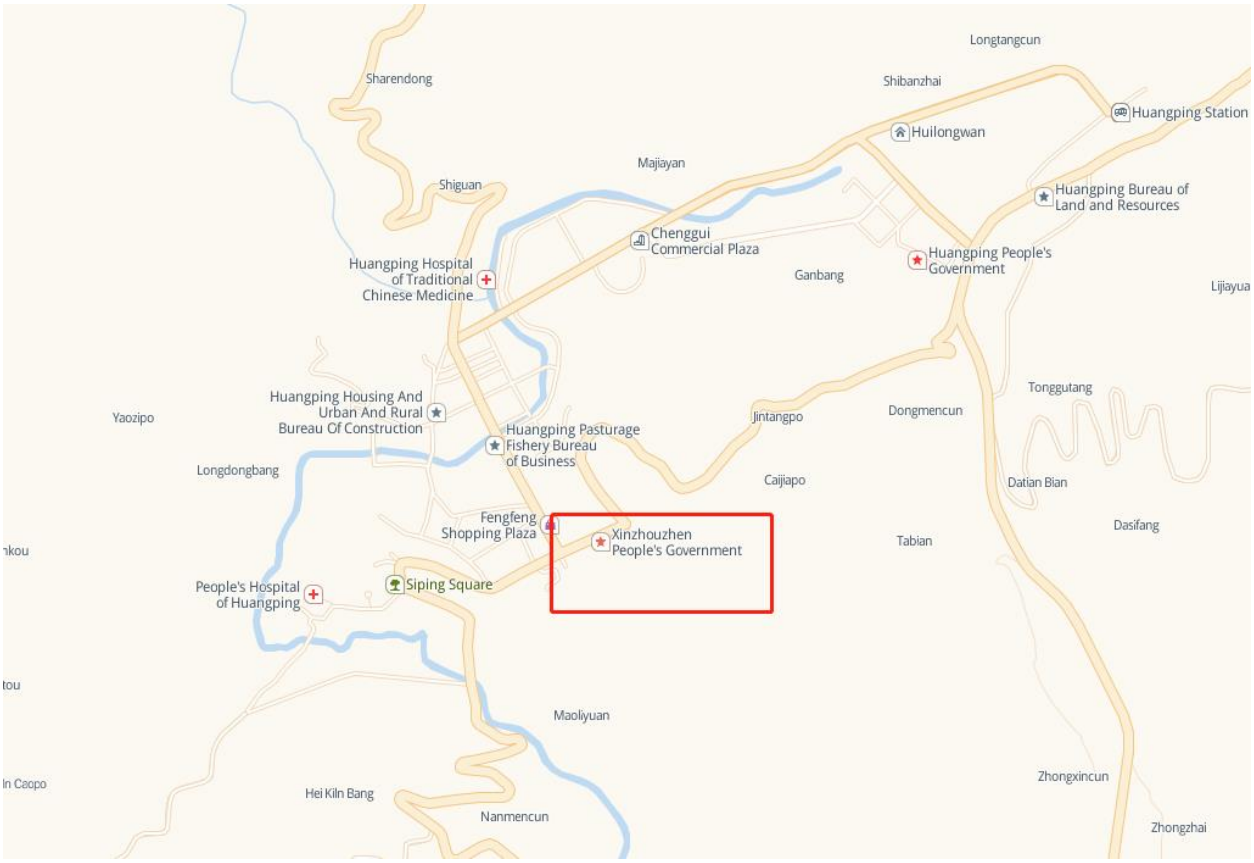
In the second step, air pump and air pipe are used for high pressure aeration, accumulation and fermentation to further lose water, to make it lose more water and become looser;

In the third step, add trace elements, stir evenly, granulate, spray microbial functional strains on the surface, and bag.

## 1.12 Project Location

The project located in Huangping County, Qiandongnan Miao and Dong Autonomous Prefecture, Guizhou Province ,China. The centre coordinates of the project site are 107°55'40"E,26°55'50"N


Zunyi
Shiqian
Wan
Xinhua
S25
S15
Yuqing
Yuping
Cengong
G60
G320
Xifeng
Kaiyang
Weng'an
Shibing
Zhenyuan
Sansui
Huangping
S25
Xiuwen
G210
Fuquan
Jianhe
Taijiang
Baiyun
G75
G6001
Guiyang
Guiding
Qiandongnan
Qingzhen
G60
Majiang
G320
S001
Longli
G210
Huaxi
S85
Leishan
Qiannan
G321
G76
Danzhai
Liping
S45
Huishui
Changshun
Sandu
Rongjiang
S15




## 1.13 Conditions Prior to Project Initiation

The project is a Greenfield project. In the absence of the project, the swine manure was left to decay in uncovered anaerobic lagoons, which is the most economic, viable and reasonable for livestock farm owners and the biomass waste residue had been left to decay anaerobically in a solid waste disposal site (SWDS). The baseline scenario is the same as the conditions existing prior to the project initiation.

## 1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

According to Recordation Certificate of Project and the approval of EIA of the project, the project complies with all Chinese relevant laws and regulations. Mainly include:

1. Environmental Protection Law of the People's Republic of China;

2. Administrative Licensing Law of the People's Republic of China;

3. Regulations on prevention and control of pollution from large scale livestock and poultry breeding.

4. Law of the People's Republic of China on the Prevention and Control of Solid Waste Pollution.

The project has obtained Recordation Certificate of Project issued by Economic and Information

Technology Bureau of Huangping County, also, the project has obtained the EIA approval from Huangping County Ecological Environment Bureau. The approvals well demonstrate that local government permits the construction of the project. Consequently, the project is compliance with laws, status and other regulatory frameworks.

## 1.15 Participation under Other GHG Programs

### 1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project has neither been registered nor seeking registration under any other GHG programs. The project is seeking registration only in VCS program.

### 1.15.2 Projects Rejected by Other GHG Programs

The project activity is not participating in other environment credits, other GHG programs and

has not been rejected by any other GHG Programs.

## 1.16 Other Forms of Credit

### 1.16.1 Emissions Trading Programs and Other Binding Limits

The project proponent is not part of any emission trading program. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs.

### 1.16.2 Other Forms of Environmental Credit

The project hasn't sought or received another form of environmental credits.

### 1.16.3 Supply Chain (Scope 3) Emissions

The project is under the scope 13.Waste handling and disposal.

## 1.17 Sustainable Development Contributions

The project activity implemented by the project owner can contribute to sustainable development as defined by and tracked against the United Nations Sustainable Development Goals (SDGs).

The specific analysis is as follows:

SDG8 Decent Work and Economic Growth

Temporary and permanent job opportunities are created for locals during the construction and operation period of the project. So, the impact parameter of the proposed project on SDG8 is the number of full-time jobs created. 25 local residents (13 females and 12 males) are employed permanently during the operation period of the project during project implementation and monitoring activities.

SDG12 Responsible consumption and production

The project activity is designed to install a set of organic fertilizers production lines to treat the manure from the swine farms and Biomass waste residue, so the organic fertilizers will be produced, which are sold as organic fertilizer.

SDG13: Climate Action

Prior to the implementation of the project, the animal manure waste was left to decay in uncovered open lagoon at the livestock farms and the biomass waste residue was left to decay in the SWDS, where the methane is emitted to the atmosphere directly without any methane recovery and destruction facility. The project activity will reduce of GHG in the atmosphere through avoiding methane emissions from aerobic treatment of the waste. So, the impact parameter of the proposed project on SDG13 is the amount of GHGs emission reductions. It is estimated that 59,776 tCO2e emission reductions can be produced annually.

## Additional Information Relevant to the Project

### Leakage Management

Not applicable.

### Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

### Further Information

Not applicable..

# 2 SAFEGUARDS

## 2.1 No Net Harm

The Environmental Impact Assessment (EIA) Report for the Project has been approved by Huangping City Ecological Environment Bureau. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project development, the construction of the project is in line with national policies and no net harm has been detected.For specific analysis, see section 2.3 below. Meanwhile, the implementation of the project will improve local-social economic development through creating career opportunities.

## 2.2 Local Stakeholder Consultation

In order to solicit the opinions and attitudes of various stakeholders on the construction of this project, the project owner issued a stakeholder survey questionnaire to investigate the opinions of local stakeholders on the construction of this project. Local stakeholders included relevant personnel of the livestock farms, local villagers and government officials. The survey questionnaire was designed to assess the project impacts on the local environment and social economic development. Totally, 40 questionnaires were sent, and 30 responses were collected.

The questionnaires mainly focus on following issues:

- Do you know the purpose of this project?

- What do you think is the impact of the implementation of this project on the local environment?

- What impact do you think the implementation of this project will have on your life?

- Are you satisfied with the environmental protection measures that the proposed project has made?

- What do you think is the impact of the proposed project on local employment?

- What do you think is the impact of the proposed project on local economy?

- Are you agree or disagree with the construction of the proposed project?

- Do you think other regions should also vigorously promote this type of technology?

- Do you have any suggestions on this project?

The structure of the survey respondents is listed in Table 2-1 below.

Table 2-1 Structure of stakeholder survey

| Items | | Amount |
|---|---|---|
| Gender stakeholders surveyed | Male | 22 |
| | female | 18 |
| Age | <25 | 5 |

| | | |
|---|---|---|
| | 25-55 | 32 |
| | >55 | 3 |
| Education | Junior high school or below | 5 |
| | Senior high school | 17 |
| | College or above | 18 |
| Occupation | Worker | 6 |
| | Farmer | 10 |
| | Management personnel | 12 |
| | Civil servant | 12 |

Comments from these questionnaires are summarized as follows:

- 100% of the respondents understand this project.

- 100% of the respondents think the proposed project would not generate environment problem.

- 100% of the respondents believe that the implementation of the project will bring economic benefits to their lives, because they get organic fertilizer at cheaper market prices.

- 100% of the respondents are satisfied about the environment protection measures that the proposed project has made.

- 96% of the respondents believe that the implementation of this project can promote employment growth; 4% of the respondents believe that it has no impact on local employment.

- 100% of the respondents think the proposed project has good impact on local economy.

- 100% of the respondents agree with the construction of the proposed project.

In general, local stakeholders are supportive of the project construction. The survey shows that a majority of local stakeholders think the Project will help improve the life of local people and promote local economic development without much adverse environmental impact. And the implementation of the project will be in strict accordance with the requirements in the EIA and EIA approval. There is no suggestion about the project design.

## 2.3 Environmental Impact

EIA of the Project has been approved by Ecology and Environment Bureau of Huangping County.

A short summary of the environmental impacts is presented below.

**1. Construction phase**

Implement the pollution prevention and control measures proposed in the EIA during construction period. The project site should be set up as a fence and timely water to reduce dust, Transport vehicles should take measures to prevent spilling of materials. The dust caused during the construction period should strictly implement the "Regulations on the Prevention and Control of Air Pollution in Guizhou Province"; wastewater should be disposed properly; waste should be removed timely and the construction time should be arranged properly, low-noise equipment should be used to ensure that noise meets the requirements of "construction site environmental noise emission standards" (GB12523-2011), and Night work is strictly prohibited.

**2. Operation phase**

**Wastewater**

The wastewater from the project will be collected into the aerobic tank , after being disposed, the wastewater is turned into the liquid fertilizer which will not do harm to the enviroment

**Air pollution**

Implement the pollution prevention and control measures proposed in the EIA during construction, the construction site should be set up as a fence and timely liquor water dust suppression, transport vehicles should take measures to prevent material spills. Dust should be strictly implemented as the provisions of the "Regulations on the Prevention and Control of Air Pollution in Hubei Province".

**Solid waste**

The collection, disposal and comprehensive utilization of solid waste should be implemented in strict accordance with the relevant national and provincial regulations. All waste packaging of the project should be collected and sold out; domestic waste should be transported and treated by relevant environmental department; if hazardous waste not identified in EIA during the implementation of the project, then it should be handled and disposed of in accordance with the requirements of hazardous waste management.

**Noise**

Low-noise equipment is applied, and measures such as basic vibration damping and sound insulation of buildings are taken for production machinery and equipment to ensure that the noise at the factory boundary meets the requirements of the Class 2 standard of the Environmental Noise Emission Standard for Industrial Enterprises (GB12348-2008).In

conclusion, the project will not have a significant negative impact on the surrounding environment during both construction and operation period. On the contrary, the project activity can reduce greenhouse gas emissions and environmental pollution caused by methane release.

## 2.4 Public Comments

Besides, as per section 3.17.6 of the VCS Standard (Version 4.2), all projects are subject to a 30-day public comment period. The date on which the project is listed on the project pipeline marks the beginning of the project's 30-day public comment period. This project will be open for public comment on the verra website. The project shall be listed, and comments shall be incorporated later

## 2.5 AFOLU-Specific Safeguards

Not applicable

.

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

The following methodologies are applicable to the project activity.

AMS-III.F Avoidance of methane emissions through composting, version 12.0

For the baseline manure emissions, this methodology refers to "AMS-III.D: Methane recovery in animal manure management systems", version 21.0;

The latest version of the following tools will also be used in this Project activity:

Tool 03: "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version03.0)"

Tool 05:" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 08.0)"

Tool 13:" Project and leakage emissions from composting (Version 02.0)"

Tool 21:" Demonstration of additionality of small-scale project activities (Version 13.1)"

All above methodology and tools can be found through:

https://cdm.unfccc.int/Reference/tools/index.html.

## 3.2 Applicability of Methodology

Justification for the choice of the selected methodology is shown in the following table:

Table 3-1 AMS-III.F Avoidance of methane emissions through composting, version 12.0

| Applicability Criteria | Justification |
|---|---|
| 1. This methodology is applicable to the composting of the organic fraction of municipal solid waste and biomass waste from agricultural or agro-industrial activities including manure. | The proposed project is designed to treat the swine manure and biomass waste residue to produce the organic fertilizers through aerobic composting. |
| 2. This methodology includes construction and expansion of treatment facilities as well as activities that increase capacity utilization at an existing facility. For project activities that increase capacity utilization at existing facilities, project participant(s) shall demonstrate that special efforts are made to increase the capacity utilization, that the existing facility meets all applicable laws and regulations and that the existing facility is not included in a separate CDM project activity. The special efforts should be identified and described. | Not applicable. The project is a new facility and does not involve expansion of any existing facility. |
| 3. This methodology is also applicable for co-composting wastewater and solid biomass waste, where wastewater would otherwise have been treated in an anaerobic wastewater treatment system without biogas recovery. The wastewater in the project scenario is used as a source of moisture and/or nutrients to the biological treatment process e.g., composting of empty fruit bunches (EFB), a residue from palm oil production, with the addition of palm oil mill effluent (POME) which is the wastewater co-produced from palm oil production. | Manure ,wastewater and solid biomass waste is under co-composting in the project ,and in the baseline the wastewater should be treated into the open anaerobic lagoons without biogas recovery . |

| | |
|---|---|
| 4. In case of co-composting, if it cannot be demonstrated that the organic matter would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-composted substrates. | Without the project , the organic matter should be put into the open anaerobic lagoons, so the baseline emissions related to such organic matter should be counted. |
| 5. The location and characteristics of the disposal site of the biomass, animal manure and co-composting wastewater in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions, using the provisions of AMS-III.G, AMS-III.E (concerning stockpile), AMS-III.D "Methane recovery in animal manure management systems" or AMS-III.H respectively. | The location and characteristics of the disposal site of the animal manure and biomass in the baseline condition are well known. The estimation of manure methane emissions as the latest version of AMS-III.D (Version 21.0) and the estimation of biomass methane emissions as the latest version of methodology tool 04 "Emission from solid waste disposal sites" (Version 08.0). |
| 6. Blending materials may be added in the project scenario to increase the efficiency of the composting process (e.g. to achieve a desirable C/N ratio or free air space value), however, only monitored quantity of solid waste or manure or wastewater diverted from the baseline treatment system is used for emission reduction calculation. Project activities for composting of animal manure shall also meet the requirements under paragraphs 3 and 4(c) of the latest version of AMS-III.D. | A small blending material i.e., bacterium agent decomposing agent is added in the process of composting, which will not be included in the emission reduction calculations. For this project, swine manure as primary material is used for composting, therefore it meets the requirements under paragraphs 3 and 4(c) of the latest versions of AMS-III.D. |
| 7. For solid wastes diverted from a solid waste disposal site, the following requirement shall be checked ex ante at the beginning of each crediting period: (a) Establish that identified landfill(s)/stockpile(s) can be expected to accommodate the waste to be used for the | Prior to the project, the biomass waste residue is left to decay anaerobically in SWDS, which is the common practice in the region. The biomass waste residue used in this project is straw, which comes from the SWDS near the project site. Also, according to the straw disposal agreement signed by the project owner |

| | |
|---|---|
| project activity for the duration of the crediting period; or (b) Establish that it is common practice in the region to dispose of the waste in solid waste disposal site (landfill)/stockpile(s). | and SWDS shows that the straw used in the project activity for the duration of the crediting period can be accommodated by the SWDS. In addition, it is expected that disposal in SWDS would continue being the common practice in the region and this can be checked at the beginning of this fixed crediting period. |
| 8. The project participants shall clearly define the geographical boundary of the region referred in paragraph 11(b), and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of the waste i.e. if waste is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In addition, it should also consider the distance to which the final product after composting will be transported. In either case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances but in no case, it shall be more than 200 km. Once defined, the region should not be changed during the crediting period(s). | The waste being used in the project activity is swine manure and biomass waste residue. The swine manure used in this project comes from local farm .Similarly, the biomass waste residue is sourced from the near SWDS which is in the same village as the project site, which is also within a radius of 50 km. The final compost obtained are sold to local farmers and business near the project site with a radius of less than 200 km. |
| 9. In case produced compost is handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) must be ensured. | The compost produced will be used as fertilizer for the soil. The compost will be applied to the soil similarly to the way used for chemical fertilizers. The low agglutination of the compost and the short time needed to apply it ensure that there is not enough time available to develop anaerobic conditions. Therefore, the proper conditions and procedures (not resulting in methane emissions) can be ensured. |
| 10. In case produced compost is treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied. | This project activity does not involve thermal/mechanical treatment to the compost once it is produced. |

| | |
|---|---|
| 11. In case produced compost is stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual organic content shall to be taken into account and calculated as per the latest version of the methodological tool "Emissions from solid waste disposal sites". | The project activity will involve storage in aerobic conditions and kept in packed bags for a limited period before it is applied by the user. Thus, the project does not involve storage of produced compost in an anaerobic condition, nor would it be delivered back to landfill. |

Further information on applicability condition (6) is provided below:

The project activity also meets the requirements of paragraph paragraphs 3 and 4(c) from methodology AMS-III.D. - "Methane recovery in animal manure management systems", version 21, as below:

**Paragraphs 3**

(a) The livestock population in the farm is managed under confined conditions;

The swine manure used to produce organic fertilizer was sourced from the Guizhou Aonong Qihuan Animal Husbandry Co., Ltd which is a leading enterprise of agricultural industrialization specializing in swine breeding in China. All the swine are managed under confined conditions, which can be confirmed during the site visit.

(b) Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise "AMS-III.H Methane recovery in wastewater treatment" shall be applied;

swine manure is dumped into open anaerobic lagoons and it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming.

(c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C;

The annual average ambient temperature at the site is 17.0°C, which is higher than 5°C.

(d) In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m;

The minimum retention time of manure waste in the open anaerobic lagoons is not less than 45 days in the baseline scenario. The open anaerobic lagoons considered in the baseline scenario are designed for deep storage and has a depth of 3-5 meters in accordance with the" design code for wastewater stabilization ponds (GJJ/T54-93)"

(e) No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.

Prior to the implementation of the project, the animal manure waste was left to decay in anaerobic manure management system (uncovered open lagoon) at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility.

Paragraphs 4:

(c) The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.

The swine manure used in this project is transported directly from the farm to the project site by closed transport vehicles, and the swine manure at the project site is not stored but instead goes directly to the mixing workshop; thus, the storage time of the manure does not exceed 45 days.

| Table 3-2 Tool 03: "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (version 03.0)" | |
|---|---|
| This tool provides procedures to calculate project and/or leakage CO2 emissions from the combustion of fossil fuels. It can be used in cases where CO2 emissions from fossil fuel combustion are calculated based on the quantity of fuel combusted and its properties. Methodologies using this tool should specify to which combustion process j this tool is being applied. | This project may consume fossil fuel during the composting process. |

| Table 3-3 Tool 04: "Emissions from solid waste disposal sites (version 08.0)" | |
|---|---|
| The tool can be used to determine emissions for the following types of applications:<br><br>(a) Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS. Methane emissions are mitigated by capturing and flaring or | The proposed project is designed to treat the swine manure and biomass waste to produce the organic fertilizers through aerobic composting; therefore, it belongs to (b), Application B is applicable for this project. |

| | |
|---|---|
| combusting the methane (e.g., "ACM0001: Flaring or use of landfill gas"). The methane is generated from waste disposed in the past, including prior to the start of the CDM project activity. In these cases, the tool is only applied for an ex-ante estimation of emissions in the project design document (CDM-PDD). The emissions will then be monitored during the crediting period using the applicable approaches in the relevant methodologies (e.g., measuring the amount of methane captured from the SWDS);<br><br>(b) Application B: The CDM project activity avoids or involves the disposal of waste at a SWDS. An example of this application of the tool is ACM0022, in which municipal solid waste (MSW) is treated with an alternative option, such as composting or anaerobic digestion, and is then prevented from being disposed of in a SWDS. The methane is generated from waste disposed or avoided from disposal during the crediting period. In these cases, the tool can be applied for both ex ante and ex post estimation of emissions. These project activities may apply the simplified approach detailed in 0 when calculating baseline emissions. | |

| Table 3-4 Tool 05: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)" | |
|---|---|
| If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:<br><br>(a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of | All the electricity used by the project will be from the China Southern Power Grid, which falls under scenario A of Tool 05 (Version 03.0). Therefore, emissions related to electricity consumption need to be calculated based on Tool 05. |

| | |
|---|---|
| electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer;<br>(b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or<br><br>(c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid. | |
| This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated:<br><br>(a) Scenario I: Electricity is supplied to the grid;<br><br>(b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or<br><br>(c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities. | This methodological tool is applied for calculating for emission by electricity consumption in project activity. The proposed project does not generate electricity. So, this criterion is not applicable. |

| | |
|---|---|
| This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emissions. | Tool 05 is only used to calculate project emissions of electricity consumption supplied by China Southern Power Grid. For conservativeness, baseline emissions of captive biogas heat generation system are ignored. Only CO2 emissions will be accounted. |

| Table 3-5 Tool 13: "Project and leakage emissions from composting (version02.0)" | |
|---|---|
| Typical applications of the tool include projects composting municipal solid wastes, agricultural wastes and digestate. | Applicable. The proposed project is designed to treat the swine manure and biomass waste to produce the organic fertilizers through aerobic composting. |
| The following sources of project emissions are accounted for in this tool:<br>(a) CH4 and N2O emission from composting;<br>(b) CO2 emissions from consumption of fossil fuels and electricity associated with composting; and<br>(c) CH4 emissions from run-off wastewater associated with co-composting. | (a) CH4 and N2O emissions from composting are accounted. (b) CO2 emissions from the consumption of fossil fuels and electricity associated with composting are accounted. (c) This project does not involve co-composting; therefore, no CH4 emissions from run-off wastewater are generated. |
| The following source of leakage emissions is accounted for in this tool:<br>(a) CH4 emissions from the anaerobic decay of the residual organic content of compost disposed of in a landfill or subjected to anaerobic storage. | The compost and waste are stored in aerobic condition, not anaerobic condition. Therefore, leakage is not accounted. |
| Transport emissions are not accounted for in this tool because it is assumed that similar transportation activities would occur in the baseline. | Transport emissions are not accounted. |
| The applicability conditions of the tools referred below also apply. | The tools referred by this project is listed in above tables. This project involves composting of manure and biomass residue through controlled aerobic treatment. No |

| | |
|---|---|
| | greenhouse gas produced during in the process of composting. Therefore, “Tool to determine the mass flow of a greenhouse gas in a gaseous Stream (version 03.0)” are not applicable for this project. |

| Table 3-6 Tool 21: “Demonstration of additionality of small-scale project activities (version13.1)” | |
|---|---|
| This methodological tool provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types. | The proposed project is designed to treat swine manure and biomass waste to produce organic fertilizers through aerobic composting. The applied methodology is AMS-III.F, as per applied methodology, the demonstration of additionality should apply this tool. |
| In validating the application of this methodological tool, Designated Operation Entities (DOEs) shall carefully assess and verify the reliability and creditability of all data, rationales, assumptions, justifications and documentation provided by project participants to support the demonstration of additionality. The elements checked during this assessment and the conclusions shall be documented transparently in the validation report. | All the data, rationales, assumptions, justifications and documentation will be provided by project participants to VVB to support the demonstration of additionality in validating the application of this methodological tool, and the elements checked during this assessment and the conclusions has been documented transparently in the validation report. |
| The use of the methodological tool “Demonstration of additionality of small-scale project activities” is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board. | Project participants will not proposing new methodologies and will not propose alternative methods to demonstrate additionality. PP use this tool to demonstration the additionality of the proposed project. |
| Project participants and coordinating/managing entities may also apply “TOOL19: Demonstration of | The proposed is a small-scale project not a microscale project, therefore, Tool 19 cannot |

| | |
|---|---|
| additionality of microscale project activities" as applicable. | be used to prove the additionality of this project activity. |

## 3.3 Project Boundary

According to methodology AMS-III.F., version 12.0, the project boundary applicable to the proposed project activity is the physical geographical site.

Table 3-6 Project boundary application

| No. | Methodology requirement | Project activity |
|---|---|---|
| a | Where the solid waste would have been disposed and the methane emission occurs in absence of the proposed project activity; | Included. The project involves swine manure and biomass waste residue for composting. All manure waste produced was left to decay in uncovered anaerobic lagoons and the biomass waste had been left to decay anaerobically in a solid waste disposal site (SWDS) prior to the project. |
| b | In the case of projects co-composting wastewater, where the co-composting wastewater would have been treated anaerobically in the absence of the project activity; | The project does not involve co-composting wastewater. |
| c | Where the treatment of biomass through composting takes place; | Included, composting plant, i.e., the project site. |
| d | Where the products from composting (compost) is handled, disposed, submitted to soil application, or treated thermally/mechanically; | Included, Fields where compost will be used as fertilizers for soil application. |
| e | And the itineraries between them (a, b, c and d) where the transportation of waste, wastewater, where applicable manure, product of treatment (compost) occurs. | Included, Transportation of waste to the project site and transportation of composting for soil application. |

The project activity boundary is defined as Figure 3-1 below.

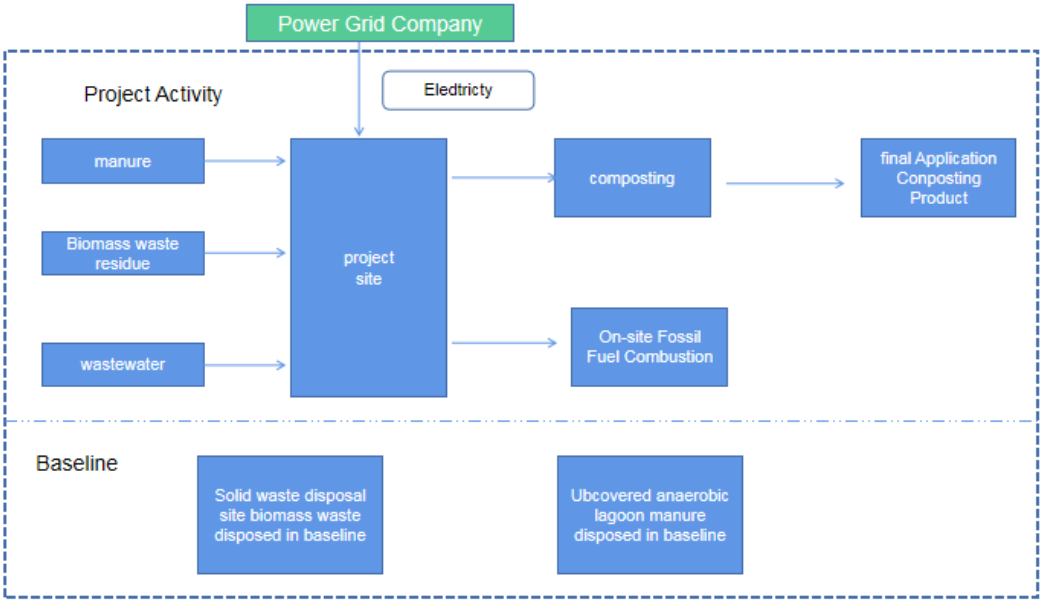



Figure 3-1 Project boundary

The greenhouse gases included or excluded from the project boundary are summarized in Table 3-7 below：

Table 3-7 Project boundary _ greenhouse gas

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Biomass disposed in solid waste | $CO_2$ | NO | $CO_2$ emissions from the decomposition of organic waste are not accounted |
| | | $CH_4$ | YES | The major source of emissions in the baseline |
| | | $N_2O$ | NO | Excluded for simplification. This is conservative. |
| | Manure disposed in uncovered anaerobic lagoon | $CO_2$ | NO | $CO_2$ emissions from the decomposition of organic waste are not accounted |
| | | $CH_4$ | YES | The major source of emissions in the baseline |
| | | $N_2O$ | NO | Excluded for simplification. This is conservative |
| Project | Emissions from transport | $CO_2$ | NO | According to Tool 13 “project and leakage emission from composting (version 02.0)”, transport emission is not accounted. |
| | | $CH_4$ | NO | Excluded for simplification. |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | $N_2O$ | NO | Excluded for simplification. |
| | Emissions from on-site electricity use | $CO_2$ | YES | An important emission source since the electricity consumed by the project is from the grid company. |
| | | $CH_4$ | NO | Excluded for simplification. |
| | | $N_2O$ | NO | Excluded for simplification. |
| | Emission from fossil fuel consumption | $CO_2$ | YES | An important emission source since fossil fuel can be used by the project. |
| | | $CH_4$ | NO | Excluded for simplification. |
| | | $N_2O$ | NO | Excluded for simplification. |
| | Emissions from composting processes | $CO_2$ | YES | May be an important emission source. |
| | | $CH_4$ | NO | Excluded for simplification. |
| | | $N_2O$ | YES | May be an important emission source. |
| | Emissions from run-off water | $CO_2$ | NO | Excluded. The project is not involving co-composting. |
| | | $CH_4$ | NO | Excluded. The project is not involving co-composting. |
| | | $N_2O$ | NO | Excluded. The project is not involving co-composting. |

.

## 3.4 Baseline Scenario

According to AMS-III.F Avoidance of methane emissions through composting, version 12.0, the baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere.

For the proposed project, swine manure and biomass waste residue are used for composting. In absence of the project, all manure waste was disposed in uncovered anaerobic lagoons in swine farm, and the biomass waste residue had been left to decay anaerobically in a solid waste disposal site (SWDS) and methane is emitted to the atmosphere.

## 3.5 Additionality

Section 3.13 in VCS standard (V4.4). states that “A project activity is additional if it can be demonstrated that the activity results in emission reductions or removals that are in excess of what would be achieved under a ‘business as usual’ scenario and the activity would not have occurred in the absence of the incentive provided by the carbon markets”. Moreover, Section 3.13.1 clearly mandates that “Additionality shall be demonstrated and assessed in accordance with the requirements set out in the methodology applied to the project”

The applied methodology of this project is AMS-III.F. “Avoidance of methane emissions through composting”(Version 12.0), as per paragraph 18 in the applied methodology, Project participants shall apply the general guidelines for the SSC CDM methodologies and the Tool for demonstration of additionality of SSC project activities available at http://cdm.unfccc.int/Reference/index.html, so the additional analysis should be based on the Tool 21 “Demonstration of additionality of small-scale project activities” (version 13.1).

According to the Tool 21, 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:

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.

Project participant has opted to demonstrate the additionality of the project by option a): investment barrier, which is discussed below:

As per Tool 21: Project participant may like to refer to “Non-binding best practice examples to demonstrate additionality for SSC project activities”. As per described in “Non-binding best practice examples to demonstrate additionality for SSC project activities”, Best practice examples include but are not limited to, the application of investment comparison analysis using a relevant financial indicator, application of a benchmark analysis or a simple cost analysis (where CDM is the only revenue stream such as end-use energy efficiency). It is recommended to use national or global accounting practices and standards for such an analysis.

As the application of investment comparison analysis using a relevant financial indicator is only applicable when alternatives are also an investment project. However, the alternative baseline of

this project is not a new investment project, so the investment comparison analysis using a relevant financial indicator is not appropriate.

As this project activity will have revenue by sales of composting products and VCUs, so a simple cost analysis is not appropriate.

In conclusion, the benchmark analysis should be carried out, and IRR is identified as the financial indicator for the benchmark analysis.

There is no benchmark for composting industry. The production of organic fertilizer and chemical fertilizers belongs to fertilizer manufacturing industry as per Industrial classification for national economic activities (GB/T 4754—2017). Therefore, according to the "Notice on adjusting financial benchmark rate of return of construction projects in some industries" issued by NDRC and Ministry of Housing and Urban-Rural Development of PRC in 2013, the benchmark of total investment financial internal rate of return (IRR) of chemical fertilizers production (after tax) is 10%.

A) Basic parameters

| Item | Value | Source |
|---|---|---|
| Annual Organic waste treatment quantity | 84594t | Project evaluation project |
| Annual organic fertilizers sales | 130,000t | Project evaluation report |
| Sales Price of organic fertilizers | 320 RMB/t | Project evaluation report |
| Total static investment | 14,681*$10^4$RMB | Project evaluation report |
| O&M cost | 2,260*$10^4$RMB | Project evaluation report |
| Operation period | 15 years | Project evaluation report |
| Emission reductions | 59,776 tCO2e/yr | Calculated |
| Price of VUCs | 60 RMB/tCO2e | Expected |

*B)* Comparison of the project IRR for the proposed project and the benchmark following table.

Without income from selling VCUs, the IRR of the proposed project is 7.51%, lower than the benchmark IRR 10% and the proposed project is financially unacceptable because of its low profitability. While considering such income, the IRR of the proposed project is 10.33%, higher than the benchmark, and the proposed project is financially acceptable.

| Item | Without income from VCUs | Benchmark IRR | With income from VCUs |
|---|---|---|---|
| The Project IRR | 7.41% | 10% | 10.16% |

*Sensitivity analysis*

The purpose of this step is to examine whether the conclusion regarding the financial attractiveness is robust to reasonable variations of the critical assumptions.

According to Guidance on the Assessment of Investment Analysis, the "variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation". Therefore, the total static investment, and organic fertilizers sales were taken as uncertain factors for sensitive analysis. Furthermore, the O&M cost which was widely included in the sensitivity analysis for projects in China was also examined in the analysis. As a result, the following parameters are selected for the analysis:

Total static Investment

Annual organic fertilizers sales

O&M cost

The variation range of -10%~10% which was employed in the Project evaluation report. The results of sensitivity analysis of the three parameters of the proposed project are shown in the table 3-8:

Table 3-8 Sensitivity analysis of the Anaerobic Digester-Aerobic Treatment（104 RMB）

| Item | -10% | -5% | 0 | 5% | 10% |
|---|---|---|---|---|---|
| Total static investment | 8.97% | 8.26% | 7.41% | 6.72% | 5.97% |
| Annual organic fertilizers sales | 4.36% | 5.81% | 7.41% | 8.83% | 9.36% |
| O&M cost | 8.97% | 8.17% | 7.41% | 6.47% | 5.67% |

Since all the data used for the investment analysis was sourced from the Project evaluation report. Therefore, the data used in the investment analysis are believed to be reliable and credible and none of above conditions can be achieved:

Total static investment decreased by about 17.63%: According to the publicly latest available sources, on the whole, the price indices for steel, fuel, power and construction materials and price indices for fixed asset investment in China have been increasing in the past years. Also, Now, the project has been completed, the project actual investment has reached 147 million RMB. As a result, the IRR cannot increase to the benchmark by decreasing the total static investment.

Annual sales of organic fertilizers are increasing by about 11.56%. The organic fertilizers are produced through the aerobic composting system, and the yield is determined by the quantity of organic waste and the production capacity of the composting system. Since the disposal amount of waste and the capacity of the composting system will stay stable in the future, the output of organic fertilizer is also stable. Thus, the increase of annual organic fertilizers sales to threshold is impossible to achieve.

O&M cost decreasing about 16.90%: However, the decrease of it is not likely to occur. The annual O&M cost of the project includes Maintenance expense, Salary, Welfare, Labor insurance expense. Housing fund expense, insurance expense, raw materials and other cost. Based on "China National Statistical Yearbook, 2021", the average salary of people employed kept rising from 2018 to 2020 (from 49,575 RMB to 5,7727RMB), the purchase price index of raw materials from 2018 to 2020 was 100.37. Moreover, the equipment will be getting more and more with the abrasion, which means the maintenance cost will be increasing in the coming years. As a result, the drastic decreasing of 16.90% in O&M cost is not realistic.

As shown in the sensitivity analysis above, the project IRR (after tax) will not reach the benchmark of 10% within reasonable fluctuation range, and the fluctuation scenario of the uncertain factors which could make the proposed project financially feasible is unlikely to occur. Therefore, the conclusion regarding the infeasibility of the proposed project is robust to reasonable variations of the critical assumptions.

To summarize, "the Project is undertaken without being registered as a VCS project activity" is not financially attractive to investors, it is not feasible. Being registered as a VCS project, the VCUs revenues can alleviate the identified barriers. Therefore the proposed project is additional.

## 3.6 Methodology Deviations

There is no methodology deviation for the project.

# 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

## 4.1 Baseline Emissions

As per para.23 of applied methodology, 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. Where bedding material is used in the baseline/project activity, the calculation shall be based on the method of paragraph 16(a) (i.e., based on animal population) of AMS-III.D (ver. 21.0). Where no bedding material is used in baseline/project activity, any of the methods provided in paragraph 16(a) and 16(b) of AMS-III.D may be used..

Baseline emissions are:

$$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} \times GWP_{CH4} \quad \text{Equation 1}$$

Where:

$BE_y$ = Baseline emissions in the year y (t CO2e).

$BE_{CH4,SWDS,y}$ = Yearly methane generation potential of 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 04 “Emissions from solid waste disposal sites” ($tCO_{2eq}$). 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)'.

$MD_{y,reg}$= Amount of methane that would have to be captured and combusted in the year y to comply with the prevailing regulations (tonne).

$BE_{CH4,manure,y}$= Where applicable, baseline emissions from manure composted by the project activities, as per the procedures in AMS-III.D (t CO2e).

$BE_{ww,y}$ = Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS-III.H (t CO2e).

$GWP_{CH4}$ = Global Warming Potential for $CH_4$ applicable to the crediting period (t $CO_2e$/t $CH_4$).

The quantification of baseline emissions for methane avoided from disposal sites ($\boldsymbol{BE_{CH4,SWDS,y}}$) applied the simplified approach to the first order decay (FOD) model, presented on the Appendix of the Tool 04. The project proponent employed the equation 15 of the Tool 04, v.8.0 (the calculations were outlined in the spreadsheet named as "BECH4,SWDS,y_Tool 04”)

$$BE_{CH4,SWDS,y} = \varphi_y \times (1 - f_y) \times GWP_{CH4} \times (1 - OX) \times \frac{16}{12} \times F \times DOC_{f,y} \times MCF_y \times \sum_{x=1}^{y} \sum_{j} (w_{j,x} \times DOC_j \times e^{-kj \times (y-x)} \times (1 - e^{-kj})) \quad \text{Equation 2}$$

Where:

$BE_{CH4,SWDS,y}$ = emissions occurring in year y generated from waste disposal at a SWDS during a time period ending in year y (t CO2e/yr)

x = Years in the time period in which waste is disposed at the SWDS, extending from the first year in the time period (x = 1) to year y (x = y)

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

$DOC_{f,y}$ = Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for year y (weight fraction)

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

$\varphi_y$ = Model correction factor to account for model uncertainties for year y

fy = 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

$GWP_{CH4}$ = Global Warming Potential of methane

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

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

$MCF_y$ = Methane correction factor for year y

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

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

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

Determining the model correction factor ($\varphi_y$)

$\varphi_y$ is used for baseline calculation, and Option 1: Use a default value is chosen. $\varphi_y = \varphi_{default}$

For the calculation of baseline emissions from the project activity Application B is chosen due to the following reason as per the methodological tool:

The project activity involves treating the biomass waste residue waste and preventing it from being disposed in solid waste disposal sites; and the methane that would have been generated is avoided from SWDS during the crediting period. As the proposed project is located in Huangping city, Guizhou Province and the climate in huangping is a subtropical humid monsoon climateclimate, also, the annual average precipitation in huangping is 1307.9mm, and the

annual average evaporation is 1400mm,, so the climate of the project site is humid. Therefore, according to the tool determined as default value and applied for humid conditions and Application B, the value of default is 0.85.

Determining the amounts of waste types j disposed in the SWDS ($W_{j,x}$)

Where different waste types j are disposed or prevented from disposal in the SWDS (for example, in the case of MSW), it is necessary to determine the amount of different waste types ($W_{j,x}$ or $W_{j,i}$). In the case that only one type of waste is disposed (for example, in the case of a residual waste), then $W_{j,x} = W_x$ and $W_{j,i} = W_i$ and the following procedures do not need to be applied (e.g. waste sampling is not required).

For this project, the biomass waste residue used for composting is straw, which belongs to wood, so only one type biomass waste residue is used for composting, therefore waste sampling is not required, $W_{j,x} = W_x$

Determining the fraction of DOC that decomposes in the SWDS ($DOC_{f,y}$)

The default value ($DOC_{f,y}$= $DOC_{f,default}$) is chosen for the proposed project.

Procedure to determine the methane correction factor ($MCF_y$)

A default value ($MCF_y$ = $MCF_{default}$) is chosen for the proposed project, which is provided in the section “Data and parameters available at validation” below.

2) Baseline emissions from manure ($BE_{CH4,manure,\ y}$)-swine manure

As per paragraph 17 of “AMS-III.D: Methane recovery in animal manure management systems”, version 21.0, Baseline emissions ($BE_{CH4,y}$) are calculated by using one of the following two options:

(a) Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 approach (please refer to the chapter ‘Emissions from Livestock and Manure Management’ under the volume ‘Agriculture, Forestry and other Land use’ of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure ($B_o$);

(b) (Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (SVS) content.

The project applies option (b) to calculate baseline emissions from the manure treatment processes ($BE_{CH4,y}$).

$$BE_{manure,j,LT,y} = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j}$$

(Equation 3)

where:

Estimation of various variables and parameters for above equations:

(a) Maximum methane producing potential($B_{0,LT}$)

The maximum methane-producing capacity of the manure ($B_{0,LT}$) varies by species and diet. The preferred method to obtain $B_{0,LT}$ measurement values is to use data from country-specific published sources, measured with a standardized method ($B_{0,LT}$ shall be based on total as-excreted VS). These values shall be compared to IPCC default values and any significant differences shall be explained. If country specific $B_{0,LT}$ values are not available, default values from tables 10 A-4 to 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 can be used, provided that the project participants assess the suitability of those data to the specific situation of the treatment site.

According to Table 10A-6 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter 10, the maximum methane producing potential ($B_{0,LT}$) for swine in East Asia and South-East Asia (Asia) is 0.29 $m^3$ $CH_4$/kg-dm.

(b) Annual methane conversion factor ($MCF_j$) for the baseline $AWMS_j$

The $MCF_j$ values given in Table 10.A-7, chapter 10, volume 4, IPCC 2006 Guidelines should be used. $MCF_j$ values depend on the site annual average temperature is taken from official data at the nearest meteorological station, or from data available from historical on-site observations.

For this project, the annual average temperature is 17.0℃ and the value of 71% is applied.

(b) Using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its Volatile solids production/excretion per animal of livestock （VS）

VS is the organic material in livestock manure and consists of both biodegradable and

Non-biodegradable fractions.

If country-specific VS values are not available IPCC default values from 2006 IPCC

Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 table 10 A-4 to

10 A-9 can be used provided that the project participants assess the suitability of those

data to the specific situation of the treatment site, particularly with reference to feeding

intake levels.

As per paragraph 18(c) of AMS-III.D, Version 21.0, the default IPCC value for VS may be adjusted for a site-specific average animal weight.

There is no specific VS value in China. For this project, the VS value of IPCC will be applied ($VS_{default}$), however, it will be adjusted considering the weight of breeding swine in the project sites ($W_{site}$). Then the following equation shall be used:

$$VS_{LT,y} = (W_{site} / W_{default,}) \times VS_{default} \times nd_y \quad \text{Equation 3}$$

where:

| | |
|---|---|
| Wsite | Average animal weight of a defined livestock population at the project site (kg) |
| Wdefault | Default average animal weight of a defined population, this data is sourced from IPCC 2006 (kg) |
| VSdefault | Default value for the volatile solid excretion rate per day on a dry-matter basis for a |
| ndy | Number of days treatment plant was operational in year y |

MDy,reg

No regulation requirements specify the amount or methane that should be captured or combusted. And therefore MDy,reg = 0.

Methane emissions from the baseline wastewater treatment systems affected by the project ($BE_{ww,treatment,y}$) are determined using the COD removal efficiency of the baseline plant:

$$BE_{ww,treatment,y} = \sum_i (Q_{ww,i,y} \times COD_{inflow,i,y} \times \eta_{COD,BL,i} \times MCF_{ww,treatment,BL,i}) \times B_{o,ww} \times UF_{BL} \times GWP_{CH4}$$

| | |
|---|---|
| $Q_{ww,i,y}$ | Volume of wastewater treated in baseline wastewater treatment system i in year y (m3 ). |
| $COD_{inflow,i,y}$ | Chemical oxygen demand of the wastewater inflow to the baseline treatment system i in year y (t/m3 ). Average value may be used through sampling with the confidence/precision level 90/10 |
| $\eta_{COD,BL,i}$ | COD removal efficiency of the baseline treatment system i, determined as per the paragraphs 35,36 or 37 |

| | |
|---|---|
| $MCF_{ww,treatment,BL,i}$ | Methane correction factor for baseline wastewater treatment systems i |
| $B_{o,ww}$ | Methane producing capacity of the wastewater (IPCC value of 0.25 kg CH4/kg COD) |
| $UF_{BL}$ | Model correction factor to account for model uncertainties (0.89)1 |
| $GWP_{CH4}$ | Global Warming Potential for methane |

*Reference: FCCC/SBSTA/2003/10/Add.2, page 25.*

.

## 4.2 Project Emissions

As per applied methodology, Project emissions from composting process ($PE_y$) shall be determined as per the Methodology Tool 13:" Project and leakage emissions from composting (Version 02.0)". $PE_y$ is equivalent to parameter $PE_{COMP,y}$ in the tool.

As per paragraph 13 in Tool 13, Project emissions are estimated as follows:

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

(Equation 4)

where:

$PE_{COMP,y}$ = Project emissions associated with composting in year *y* (t $CO_2e$/yr)

$PE_{EC,y}$ = Project emissions from electricity consumption associated with composting in year *y* (t $CO_2$/yr)

$PE_{FC,y}$ = Project emissions from fossil fuel consumption associated with composting in year *y* (t $CO_2$/yr)

$PE_{CH4,y}$ = Project emissions of methane from the composting process in year *y* (t $CO_2e$/yr)

$PE_{N2O,y}$ = Project emissions of nitrous oxide from the composting process in year *y* (t $CO_2e$/yr)

$PE_{RO,y}$ = Project emissions of methane from run-off wastewater associated with co-composting in year *y* (t $CO_2e$/yr)

1) Project emissions from electricity consumption associated with composting in year y ($PE_{EC,y}$)

The electricity used in this project comes from regional power grid, i.e., East China Power Grid, $PE_{EC,y}$ shall be calculated using the Tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation".

$$PE_{EC,y} = \sum_{j,LT} EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$$

(Equation 5)

Where:

| | | |
|---|---|---|
| $PE_{EC,y}$ | = | Project emissions from electricity consumption in year y (t $CO_2e$) |
| $EG_{PJ,J,y}$ | = | Quantity of electricity consumed by the project electricity consumption source *j* in year *y* (MWh/yr) |
| $EF_{EF,j,y}$ | = | Emission factor for electricity generation for source *j* in year *y* (t $CO_2$/MWh) |
| $TDL_{j,y}$ | = | Average technical transmission and distribution losses for providing electricity to source *j* in year *y* |

2) Project emissions from fossil fuel consumption associated with composting in year y ($PE_{FC,y}$)

Where the composting activity involves fossil fuel consumption, project participants may choose between the following two options to calculate $PE_{FC,y}$:

Option 1: Procedure using monitored data

$PE_{FC,y}$ shall be calculated using the latest approved version of the "Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion", where the project emission source j referred to in the tool is composting.

Option 2: Procedure using a default value

Project emissions from fossil fuel consumption associated with composting are calculated as follows:

$$PE_{FC,y} = Q_y \times EF_{FC,default}$$

(Equation 6)

Where:

| | | |
|---|---|---|
| $PE_{FC,y}$ | = | Project emissions from fossil fuel consumption associated with composting in year *y* (t $CO_2$/ yr) |
| $Q_y$ | = | Quantity of waste composted in year *y* (t/yr) |
| $EF_{FC,default}$ | = | Default emission factor for fossil fuels consumed by the composting activity per tonne of waste (t $CO_2$/t) |

The project applies option (1) to calculate project emissions from fossil fuel consumption associated with composting ($PE_{FC,y}$).

As per methodology Tool 03 "Tool to calculate project or leakage $CO_2$ emissions from fossil fuel combustion (Version03.0)", $CO_2$ emissions from fossil fuel combustion in process j are calculated based on the quantity of fuels combusted and the $CO_2$ emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum_i FC_{i,J,y} \times NCV_{i,y} \times EF_{CO2,i,y}$$

(Equation 7)

Where:

$PE_{FC,j,y}$ = the $CO_2$ emissions from fossil fuel combustion in process *j* during the year *y* ($tCO_2$/yr)

$FC_{i,j,y}$ = the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit/yr)

$NVC_{i,y}$ = the weighted average net calorific value of the fuel type *i* in year *y* (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = the weighted average $CO_2$ emission factor of fuel type *i* in year *y* ($tCO_2$/GJ)

3) Project emissions of methane from the composting process in year *y* ($PE_{CH4,y}$)

$$PE_{CH4,y} = Q_y \times EF_{CH4,Y} \times GWP_{CH4}$$

(Equation 8)

Where:

$PE_{CH4,y}$ = Project emissions of methane from the composting process in year *y* (t $CO_2e$ / yr)

$Q_y$ = Quantity of waste composted in year *y* (t/yr)

$EF_{CH4,y}$ = Emission factor of methane per tonne of waste composted valid for year *y* (t $CH_4$ / t)

$GWP_{CH4}$ = Global Warming Potential of $CH_4$ (t $CO_2e$ / t $CH_4$)

Determining parameter of $EF_{CH4,y}$

There are two options which project participants may choose for determining $EF_{CH4,y}$.

Option 1: Procedure using monitored data

$EF_{CH4,y}$ is determined based on measurements of the methane emissions during a composting cycle ($ECC_{CH4,c}$), as follows:

$$EF_{CH4,y} = \frac{\sum_{c=1}^{x} ECC_{CH4}/Q_c}{x}$$

(Equation 9)

Where:

$EF_{CH4,y}$ = Emission factor of methane per ton of waste composted valid for year *y* (t $CH_4$/t)

$ECC_{CH4,c}$ = Methane emissions from composting during the composting cycle *c* (t $CH_4$)

$Q_y$ = Quantity of waste composted in composting cycle c (t)

c = Composting cycles for which measurements were undertaken

x = Number of composting cycles *c* for which emissions were measured in year *y* (at least three)

Option 2: Procedure using default values

A default value is used: $EF_{CH4,y}$= $EF_{CH4,default}$. The default value is provided in the "Data and parameters not monitored" section of this tool.

For this project, default value for $EF_{CH4,y}$ is adopted, which is listed in the "Data and parameters available at validation" section.

4) Project emissions of nitrous oxide from the composting process *(*$PE_{N2O,y}$*)*

$$PE_{N2O,y} = Q_y \times EF_{N2O,Y} \times GWP_{N2O}$$

(Equation 10)

Where:

$PE_{N2O,y}$ = Project emissions of nitrous oxide from composting in year *y* (t $CO_2e$/yr)

$Q_y$ = Quantity of waste composted in year *y* (t/yr)

$EF_{N2O,y}$ = Emission factor of nitrous oxide per ton of waste composted valid for year *y* (t $N_2O$/t)

$GWP_{N2O}$ = Global Warming Potential of $N_2O$ (t $CO_2e$/t $N_2O$)

Determining parameter of $EF_{N2O,y}$

There are two options which project participants may choose for determining $EF_{N2O,y}$:

Option 1: Procedure using monitored data

$EF_{N2O,y}$ is determined based on measurements of the methane emissions during a composting cycle ($ECC_{N2O,y}$), as follows:

$$EF_{N2O,y} = \frac{\sum_{c=1}^{x} ECC_{N2O}/Q_c}{x}$$

(Equation 11)

Where：

$EF_{N2O,y}$ = Emission factor of nitrous oxide per ton of waste composted valid for year *y* (t $N_2O$/t)

$ECC_{N2O,c}$ = Nitrous oxide emissions from composting during the composting cycle *c* (t $N_2O$)

Qy = Quantity of waste composted in composting cycle c (t)

c = Composting cycles for which measurements were undertaken

x = Number of composting cycles *c* for which emissions were measured in year *y* (at least three)

Option 2: Procedure using default values

A default value is used: $EF_{N2O,y}$= $EF_{N2O,default}$. The default value is provided in the "Data and parameters not monitored" section of this tool.

For this project, default value for $EF_{N2O,y}$ is adopted, which is listed in the "Data and parameters available at validation" section.

5) Project emissions from run-off wastewater *($PE_{RO,y}$)*

Project emissions of methane from run-off wastewater ($PE_{RO,y}$) are calculated only for the case of co-composting.

$$PE_{RO,y} = Q_{COD,y} \times B_{0,ww} \times MCF_{ww,treatment} \times \varphi \times GWP_{CH4}$$

Where:

| | | |
|---|---|---|
| $PE_{RO,y}$ | = | Project emissions of methane from run-off wastewater associated with co-composting in year y (t CO2e / yr) |
| $Q_{COD,y}$ | = | Quantity of COD of the run-off wastewater from the co-composting installation in year *y* (t COD / yr) |
| $B_{0,ww}$ | = | Default methane producing capacity of the run-off wastewater (t $CH_4$ / t COD) |
| $MCF_{ww,treatment}$ | = | Default methane correction factor for the wastewater treatment system where the run-off wastewater is treated |
| $\varphi$ | = | Default model correction factor to account for model uncertainties of methane emissions from run-off wastewater |
| $GWP_{CH4}$ | = | Global Warming Potential of methane (t $CO_2e$ / t $CH_4$) |

## 4.3 Leakage

As per the methodology, If the project technology is the equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects are to be considered ($LEy$). However, in case of the project activity there is no equipment transferred from another activity nor is any existing equipment transferred to another activity. The project is greenfield project and all equipment applied is new.

In case compost is subject to anaerobic storage or disposed of in a SWDS, leakage shall be estimated to account for methane emissions from the anaerobic decay of compost. However, the compost won't be subjected to anaerobic storage, neither disposed in a SWDS.

Therefore, this is no leakage emissions associated the project activity.

## 4.4 Net GHG Emission Reductions and Removals

D Describe the procedure for estimation of net GHG emission reductions and removals. Include As per applied methodology, in the case of construction of new composting facilities or

expansion of capacity of existing composting facilities, the emission reduction achieved by the project activity will be measured as the difference between the baseline emission and the sum of the project emission and leakage. The project belongs to the construction of new composting facilities; therefore, the calculation is as following:

$$ER_y = BE_y - (PE_y + LE_y)$$

(Equation 12)

Where：

ERy = Emission reduction in the year y (tCO2e)

BEy = Baseline Emission in the year y (tCO2e)

PEy = Project Emission in the year y (tCO2e)

LEy = Leakage Emission in the year y (tCO2e)

As per described above, Ex-ante calculation result of GHG emission reductions is as following:

1. Calculation result of baseline emissions:

Table 4-1 Ex-ante calculation of $BE_{CH4,SWDS,y}$

| Parameter | value | Unit | source |
|---|---|---|---|
| $\varphi_y$ | 0.85 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| fy | 0 | - | Local regulation/requirement |
| GWPCH4 | 28 | $tCO_2/tCH_4$ | IPCC AR5 |
| OX | 0.1 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| F | 0.5 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| $DOC_{f,y}$ | 0.5 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| $MCF_y$ | 0.8 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| Wj,x | 84594.00 | t/yr | Project evaluation report |
| $DOC_j$ | 43% | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |
| $K_j$ | 0.03 | - | Tool 04: "Emissions from solid waste disposal sites (version08.0)" |

Table 4-2 $BE_{CH4,SWDS,y}$ result from Year1 – Year 10

| Year | $BE_{CH4,SWDS,y}$ (tCO2e) |
|---|---|
| Year 1 | 6,140 |

| | |
|---|---|
| Year 2 | 12,099 |
| Year 3 | 17,883 |
| Year 4 | 23,495 |
| Year 5 | 28,941 |
| Year 6 | 34,226 |
| Year 7 | 39,356 |
| Year 8 | 44,333 |
| Year 9 | 49,164 |
| Year 10 | 53,851 |

Table 4-3 Ex-ante calculation of $BE_{CH4,manure,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| GWPCH4 | 28 | $tCO_2/tCH_4$ | IPCC AR5 |
| DCH4 | 0.00067 | t/m | AMS-III.D: Methane recovery in animal manure management systems", version 21.0 |
| $UF_b$ | 0.94 | - | AMS-III.D: Methane recovery in animal manure management systems", version 21.0 |
| $MCF_j$ | 0.74 | - | AMS-III.D: Methane recovery in animal manure management systems", version 21.0, temperature of the project site is 12.9˚C, |
| Bo,LT | 0.29 | $m^3CH_4/kg\text{-}dm$ | IPCC 2006 table 10A-9, chapter 10, volume 4 |
| Qmanure,j,LT,y | 13000 | tons/yr, dry basis | Project evaluation report |
| SVSj,LT,y | 80% | tons/tons, dry basis | Project evaluation report |
| BECH4,manure,y | 39357 | $tCO_2e$ | calculated |

Table 4-4 Ex-ante calculation of $BE_{ww,treatment,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| Qww,i,y | 33799 | $m^3/yr$ | Project evaluation report |
| CODinflow,i,y | 0.0496 | | Project evaluation report |
| η COD,BL,i | 0.8896 | - | Project evaluation report |
| MCFww,treatment,BL,i | 0.5 | - | Default values from chapter 6 of volume 5. Waste in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |

| | | | |
|---|---|---|---|
| Bo,ww | 0.25 | $m^3CH_4/kg\text{-}dm$ | IPCC 2006 table 10A-9, chapter 10, volume 4 |
| UFBL | 0.89 | tons/yr, dry basis | Project evaluation report |
| GWPCH4 | 25 | tCO2/tCH4 | IPCC AR5 |
| $BEww,treatment,y$ | 4148 | $tCO_2e$ | calculated |

Table 4-5 the results of $BE_{CH4,,y}$

| BECH4,*SWDS*, y ($tCO_2e$) | BECH4,manure, y ($tCO_2e$) | $BEww,treatment, y$ | BECH4,, y ($tCO_2e$) |
|---|---|---|---|
| 6,140 | 39357 | 4148 | 49,645 |
| 12,099 | 39357 | 4148 | 55,604 |
| 17,883 | 39357 | 4148 | 61,388 |
| 23,495 | 39357 | 4148 | 67,000 |
| 28,941 | 39357 | 4148 | 72,446 |
| 34,226 | 39357 | 4148 | 77,731 |
| 39,356 | 39357 | 4148 | 82,861 |
| 44,333 | 39357 | 4148 | 87,838 |
| 49,164 | 39357 | 4148 | 92,669 |
| 53,851 | 39357 | 4148 | 97,356 |

2.Calculation result of project emissions:

Table 4-6 Ex-ante calculation of $PE_{EC,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| $EC_{PJ,j,y}$ | 280 | MWh/yr | Project evaluation report |
| $EF_{EF,j,y}$ | 0.50885 | $tCO_2/MWh$ | Published by DNA |
| $TDL_{j,y}$ | 20% | - | Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation |
| $PE_{EC,y}$ | 171 | $tCO_2e$ | calculated |

Table 4-7 Ex-ante calculation of $PE_{FC,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| FCi,j,y | 0 | ton/yr | Project evaluation report |
| $NVC_{i,y}$ | 43.3 | GJ/ton | Diesel, upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC |
| EFCO2,i,y | 0.0748 | $tCO_2/GJ$ | Diesel, upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC |

| | | | |
|---|---|---|---|
| PEFC,y | 0 | $tCO_2e$ | calculated |

Table 4-8 Ex-ante calculation of $PE_{CH4,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| $Q_y$ | 133079 | t/yr | Project evaluation report |
| GWPCH4 | 28 | $tCO_2/tCH_4$ | IPCC AR5 |
| EFCH4,y | 0.002 | $tCH_4/t$ | Tool 13:" Project and leakage emissions from composting (Version 02.0)" |
| PECH4,y | 7453 | $tCO_2e$ | calculated |

Table 4-9 Ex-ante calculation of $PE_{N2O,y}$

| Parameter | Value | Unit | Source |
|---|---|---|---|
| $Q_y$ | 133079 | t/yr | Project evaluation report |
| GWPN2O | 265 | $tCO_2/tN_2O$ | IPCC AR5 |
| EFN2O,y | 0.0002 | $tN_2O/t$ | Tool 13:" Project and leakage emissions from composting (Version 02.0)" |
| PEN2O,y | 7054 | $tCO_2e$ | calculated |

Table 4-10 the result of $PE_y$

| **$PE_{EC,y}$ ($tCO_2e$)** | **$PE_{FC,y}$ ($tCO_2e$)** | **$PE_{CH4,y}$ ($tCO_2e$)** | **$PE_{N2O,y}$ ($tCO_2e$)** | **Project emission($tCO_2e$)** |
|---|---|---|---|---|
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 171 | 0 | 7,453 | 7,054 | 14,678 |
| 1,710 | 0 | 74,530 | 70,540 | 146,780 |

| Year | Estimated baseline emissions or removals ($tCO_2e$) | Estimated project emissions or removals ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated net GHG emission reductions or removals ($tCO_2e$) |
|---|---|---|---|---|
| 1 | 49,645 | 14,678 | 0 | 34,967 |

| | | | | |
|---|---|---|---|---|
| 2 | 55,604 | 14,678 | 0 | 40,926 |
| 3 | 61,388 | 14,678 | 0 | 46,710 |
| 4 | 67,000 | 14,678 | 0 | 52,322 |
| 5 | 72,446 | 14,678 | 0 | 57,768 |
| 6 | 77,731 | 14,678 | 0 | 63,053 |
| 7 | 82,861 | 14,678 | 0 | 68,183 |
| 8 | 87,838 | 14,678 | 0 | 73,160 |
| 9 | 92,669 | 14,678 | 0 | 77,991 |
| 10 | 97,356 | 14,678 | 0 | 82,678 |
| Total (tCO2e) | 744,538 | 146,780 | 0 | 597,758 |

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

| | |
|---|---|
| Data / Parameter | $GWP_{CH4}$ |
| Data unit | $tCO_2/tCH_4$ |
| Description | Global Warming Potential of $CH_4$ |
| Source of data | IPCC Fifth Assessment Report |
| Value applied | 28 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | 100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014, which complies with the requirement described in Section 3.14.4 of VCS Standard (V4.4). |
| Purpose of Data | Calculation of baseline emissions and project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $GWP_{N2O}$ |
| Data unit | $tCO_2e/tN_2O$ |
| Description | Global Warming Potential of $N_2O$ |
| Source of data | IPCC Fifth Assessment Report |
| Value applied | 265 |
| Justification of choice of data or description of measurement methods and procedures applied | 100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report, 2014, which complies with the requirement described in Section 3.14.4 of VCS Standard (4.4) |
| Purpose of Data | Calculation of baseline emissions and project emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $D_{CH4}$ |
| Data unit | $t/m^3$ |
| Description | Density of $CH_4$ |
| Source of data | AMS-III.D Version 21.0 |
| Value applied | 0.00067 |
| Justification of choice of data or description of measurement methods and procedures applied | 0.00067 $t/m^3$ at room temperature 20℃ and 1 atm pressure. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $MCF_j$ |
| Data unit | - |
| Description | Methane conversion factor for the baseline AWMSj |
| Source of data | IPCC 2006 table 10.17, chapter 10, volume 4 |
| Value applied | 74% |
| Justification of choice of data or description of measurement methods and procedures applied | MCFj value for uncovered anaerobic lagoon (baseline AWMS) is chosen.<br>For this project, the annual average temperature is 15.6℃ and the conservative value of 74% is applied. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $UF_b$ |
| Data unit | / |
| Description | Model correction factor to account for model uncertainties |
| Source of data | AMS-III.D, version 21.0 |
| Value applied | 0.94 |
| Justification of choice of data or description of measurement methods and procedures applied | As per the methodology AMS-III.D, the value of this parameter is 0.94 |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $\varphi_{default}$ |
| Data unit | / |
| Description | Default value for the model correction factor to account for model uncertainties |
| Source of data | Tool 04: “Emissions from solid waste disposal sites (version 08.0)” |

<table>
<tr><td>Value applied</td><td>0.85</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>For baseline emissions: refer to the table below to identify the appropriate factor based on the application of the tool (A or B) and the climate where the SWDS is located.<br>Default values for the model correction factor<br><table><tr><td></td><td>Humid/wet conditions</td><td>Dry conditions</td></tr><tr><td>Application A</td><td>0.75</td><td>0.75</td></tr><tr><td>Application B</td><td>0.85</td><td>0.8</td></tr></table><br>According to the analysis in section 3.2 of this JPM, the proposed project type is Application B. This project is located in Huangping County and the climate in Huangping County is a subtropical humid monsoon climate, the annual average precipitation in huangping is 1307.9mm, and the annual average evaporation is 1,746.6mm<br>, so the climate of the project site is humid.<br>Therefore, the value of default is 0.85.</td></tr>
<tr><td>Purpose of Data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Comments</td><td>N/A</td></tr>
</table>

<table>
<tr><td>Data / Parameter</td><td>OX</td></tr>
<tr><td>Data unit</td><td>/</td></tr>
<tr><td>Description</td><td>Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)</td></tr>
<tr><td>Source of data</td><td>Table 3.2, Section 3.2.3, Chapter 3, Volume 5, 2006 IPCC Guidelines for National Greenhouse Gas Inventories.</td></tr>
<tr><td>Value applied</td><td>0.1</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>As per Tool 04 (Version08.0), this parameter can be sourced from “2006 IPCC Guidelines for National Greenhouse Gas Inventories” which is a reliable data source.</td></tr>
</table>

| | |
|---|---|
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | F |
| Data unit<br>Description | /<br>Fraction of methane in the SWDS gas (volume fraction) |
| Source of data | Section 3.2.3, Chapter 3, Volume 5, IPCC 2006 Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.5 |
| Justification of choice of data or description of measurement methods and procedures applied | As per Tool 04 (Version08.0), this parameter can be sourced from "2006 IPCC Guidelines for National Greenhouse Gas Inventories" which is a reliable data source. |
| Purpose of Data | Calculation of baseline emissions |
| 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. |

| | |
|---|---|
| Data / Parameter | $DOC_{f,default}$ |
| Data unit | Weight fraction |
| Description | Default value for the fraction of degradable organic carbon ($DOC_{f,default}$) in MSW that decomposes in the SWDS |
| Source of data | Section 3.2.3, Chapter 3, Volume 5, IPCC 2006 Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.5 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | As per Tool 04 (Version08.0), this parameter can be sourced from "2006 IPCC Guidelines for National Greenhouse Gas Inventories" which is a reliable data source. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $MCF_{default}$ |
| Data unit | - |
| Description | Methane correction factor |
| Source of data | IPCC 2006 Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.8 |
| Justification of choice of data or description of measurement methods and procedures applied | Default value in Tool 04: "Emissions from solid waste disposal sites (version08.0)"<br>As project evaluation report, the baseline for biomass waste is to decay in unmanaged solid waste disposal site-deep, which is the most economic treatment method.<br>The baseline solid waste disposal site has a depth of around 7 meters, which justifies the choice of value for MCF. |
| Purpose of Data | Calculation of baseline emissions |
| Comments | The MCF accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS. |

| | |
|---|---|
| Data / Parameter | $DOC_j$ |
| Data unit | - |
| Description | Fraction of degradable organic carbon in the waste type *j* (weight fraction) |

<table>
<tr><td>Source of data</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)</td></tr>
<tr><td>Value applied</td><td>43%</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>For MSW, the following values for the different waste types j should be applied:
<table>
<tr><td>Waste type j</td><td>$DOC_j$ (% wet waste)</td></tr>
<tr><td>Wood and wood product</td><td>43</td></tr>
<tr><td>Pulp, paper and carboard (other than sludge)</td><td>40</td></tr>
<tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td></tr>
<tr><td>Textiles</td><td>24</td></tr>
<tr><td>Garden, yard and park waste</td><td>20</td></tr>
<tr><td>Glass, plastic, metal, other inert waste</td><td>0</td></tr>
</table>
For this project, Biomass waste residue i.e., straw is used for composting, which is similar waste type of wood waste, therefore 43% is applied for calculation.</td></tr>
<tr><td>Purpose of Data</td><td>Calculation of baseline emissions</td></tr>
<tr><td>Comments</td><td>N/A</td></tr>
</table>

<table>
<tr><td>Data / Parameter</td><td>$k_j$</td></tr>
<tr><td>Data unit</td><td>1/yr.</td></tr>
<tr><td>Description</td><td>The decay rate for the waste type j</td></tr>
<tr><td>Source of data</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)</td></tr>
<tr><td>Value applied</td><td>0.03</td></tr>
<tr><td>Justification of choice of data or description of measurement methods and procedures applied</td><td>Apply the following default values for the different waste types j:<br>Default values for the decay rate (kj)
<table>
<tr><td rowspan="2">Waste type j</td><td colspan="2">Boreal temperate (MAT≤20°C)</td><td colspan="2">Tropical (MAT>20°C)</td></tr>
<tr><td>Dry (MAP/PET <1)</td><td>Wet (MAP/PET>1)</td><td>Dry (MAP <1000mm)</td><td>Wet (MAP>1000mm)</td></tr>
</table></td></tr>
</table>

| | | | | | | |
|---|---|---|---|---|---|---|
| | Slowly degrading | Pulp, paper, cardboard (other than sludge), textiles | 0.04 | 0.06 | 0.045 | 0.07 |
| | | Wood, wood products and straw | 0.02 | 0.03 | 0.025 | 0.035 |
| | Moderately degrading | Other (non-food) organic putrescible garden and park waste | 0.05 | 0.10 | 0.065 | 0.17 |
| | Rapid degrading | Food, food waste, sewage sludge, beverages and tobacco | 0.06 | 0.185 | 0.085 | 0.4 |
| | Note: MAT – mean annual temperature, MAP – Mean annual precipitation, PET – potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration.<br>This project is located in Huangping City, the annual average ambient temperature is 17.0°C, the annual average precipitation in huangping is 1307.9mm, and the annual average evaporation is 1,746.6mm in Huangping City. Biomass waste residue i.e., straws used for composting, which is similar waste type of wood waste, therefore 0.03 is applied for calculation. | | | | | |
| Purpose of Data | Calculation of baseline emissions | | | | | |
| Comments | N/A | | | | | |

| | |
|---|---|
| Data / Parameter | $EF_{CH4,default}$ |
| Data unit | $tCH_4/t$ |
| Description | Default emission factor of methane per tonne of waste composted<br>(wet basis) |
| Source of data | Tool 13:" Project and leakage emissions from composting (Version<br>02.0)" |
| Value applied | 0.002 |
| Justification of choice of data or description of measurement methods and procedures applied | As per Tool 13 (Version 02.0), the value of this parameter should apply 0.002 |
| Purpose of Data | Calculation of project emission |

| | |
|---|---|
| Comments | Applicable to Option 2 in the step "Determination of methane and nitrous oxide emissions from the composting process" |

| | |
|---|---|
| Data / Parameter | $EF_{N2O,default}$ |
| Data unit | $tN_2O/t$ |
| Description | Default emission factor of nitrous oxide per tonne of waste composted (wet basis) |
| Source of data | Tool 13:" Project and leakage emissions from composting (Version 02.0)" |
| Value applied | 0.0002 |
| Justification of choice of data or description of measurement methods and procedures applied | As per Tool 13 (Version 02.0), the value of this parameter should apply 0.0002 |
| Purpose of Data | Calculation of project emission |
| Comments | Applicable to Option 2 in the step "Determination of methane and nitrous oxide emissions from the composting process" |

.

## 5.2 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 to the atmosphere in year *y* |
| Source of data | Select the maximum value from the following: (a) contract or regulation requirements specifying the amount of methane that must be destroyed/used (if available) and (b) historic data on the amount captured |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | In China, there are no laws and regulations that require mandatory specifying the amount of methane that must be destroyed/used, so the value is 0. |
| Frequency of monitoring/recording | Annually |
| Value applied | 0 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | During the monitoring period, this value will be updated according to the specifying the amount of methane that must be destroyed/used that is mandated by laws and regulations |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $W_{j,x}$ |
| Data unit | t |
| Description | Total amount of waste disposed in a SWDS in year x |
| Source of data | Data sourced from Project proponents, which is measured by Belt scale in project site |
| Description of measurement methods and procedures to be applied | Measure on wet basis and by Belt scale 1 |
| Frequency of monitoring/recording | Continuously, aggregated at least annually for year x or monthly for month i |
| Value applied | 84594 tons biomass waste residue used for ex-estimated which is sourced from project evaluation report. |
| Monitoring equipment | Belt scale 1 |

| | |
|---|---|
| QA/QC procedures to be applied | This parameter can be sourced from "Biomass treatment daily record" recorded by PP.<br>Archive electronically during project plus 5 years.<br>Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and |
| | frequency of calibration is according to manufacturer's specifications. |
| Purpose of data | Calculation of baseline emissions and project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $B_{0,\,LT}$ |
| Data unit | $m^3CH_4/kg\text{-}dm$ |
| Description | Maximum methane producing potential of the volatile solid generated by animal type *LT* |
| Source of data | IPCC 2006 table 10A-6, chapter 10, volume 4 |
| Description of measurement methods and procedures to be applied | $B_{0,\,LT}$ can be measured as per ISO 11734:1995. As this parameter is not monitored in the actual operation. So, in the monitoring period 0.29 $m^3CH_4/kg$ -dm is still applied. |
| Frequency of monitoring/recording | Annually |
| Value applied | $B_{0,\,LT}$ (Swine) =0.29 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | The value is taken from published sources. The parameter value should be updated on latest available public data source. |
| Purpose of Data | Calculation of baseline emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $Q_{manure,LT,y}$ |

| | |
|---|---|
| Data unit | Tons-dm/year |
| Description | Quantity of manure treated from livestock type *LT* at animal manure management system *j* |
| Source of data | Data sourced from Project proponents and this parameter can be calculated by the Quantity of manure (wet basis) and the moisture content of manure (wet basis). |
| Description of measurement methods and procedures to be applied | Quantity of manure (wet basis) is measured by electronic truck scale in project site.<br>Moisture content of manure (wet basis) is measured by electronic balance and Electric heating blast drying oven as per GB/T25169 Technical specifications for monitoring of animal manure. The electronic balance is used to measure the net weight of container ($m_0$), the weight of wet basis manure with container ($m_1$), the weight of dry manure with the container ($m_2$). The process of the manure from the wet basis to the dry basis is realized by drying in the electric heating blast drying oven. The moisture content in Swine manure can be calculated by the formula: $\frac{m_2-m_0}{m_1-m_0} \times 100\%$ |
| Frequency of monitoring/recording | The Quantity of daily manure (wet basis) entering the project site is measured by electronic truck scale and the data is summarized monthly.<br>The moisture content of daily manure entering the project site needs to be measured. The monthly moisture content used in the emission reduction calculation is calculated by the weighted average of the daily moisture content and the daily quality of Swine manure entering the project site. |
| Value applied | 13000 tons swine manure (dry basis) used for ex-estimated which is sourced from project evaluation report. |
| Monitoring equipment | electronic truck scale, electronic balance and Electric heating blast drying oven |

| | |
|---|---|
| QA/QC procedures to be applied | Calculated by the Quantity of manure (wet basis) multiply (1- moisture content of manure (wet basis)).<br>The Periodic calibration of electronic truck scale and electronic balance should be conducted by an independent accredited laboratory, and which is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications.<br>The electric heating blast drying oven do not require calibration. |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | Quantity of manure (dry basis) = quantity of manure (wet basis) × (1- moisture content of manure (wet basis)) |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $SVS_{j,LT,y}$ |
| Data unit | tons VS/tons--dm |
| Description | Specific volatile solids content of animal manure from livestock type *LT* and animal manure management system *j* in year *y* |
| Source of data | Data sourced from Project proponents, which is measured as per the guideline in annex 2 of AM0073. |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | Method for determination of Volatile Solids in animal waste.<br>From: USDA. Agricultural Waste Management Field Handbook.<br>Chapter 4 - Agricultural Waste Characteristics. Page 2.<br><u>Definitions</u><br>• Total Solids: Residue remaining after water is removed from waste material by evaporation; dry matter;<br>• Volatile Solids: The part of total solids driven off as volatile (combustible) gases when heated to 600ºC; organic matter;<br>• Fixed Solids: The part of total solids remaining after volatile gases driven off at 600ºC; ashes.<br><u>Determination method</u><br>1 - Evaporate free water on steam able and dry in oven at 103°C for 24 hours or until constant weight to obtain the Total Solids. 2 - Place Total Solids residue in furnace at 600ºC for at least 1 hour. Volatile Solids are determined from weight difference of total and Fixed Solids.<br>$$volatile\ matter(drybasis) = \frac{W2 - Wf}{W2 - W1}$$<br>Where $W_1$ is the weight of sample container, $W_2$ is combined weight of the sample container and oven dried sample, $W_f$ is the combined constant weight of the sample container and sample after heating at 600ºC |
| | |
| Frequency of monitoring/recording | Annually |
| Value applied | 65% is used for ex for ex-ante calculation which is sourced from project evaluation report. $SVS_{j,LT,y}$ will be determined as the guideline in annex 2 of AM0073 during the monitoring period. |

| | |
|---|---|
| Monitoring equipment | Electronic balance and Muffle furnace.<br>Electronic balance is used to measure the net weight of Evaporating dish ($W_1$), the weight of Evaporating dishes and dry Swine manure ($W_2$), the weight of Evaporating dishes and the Swine manure after 600 ˚C burning ($W_f$). The muffle furnace is used to heat the dry basis manure to 600˚C to remove the volatile solids in the dry basis manure. |
| QA/QC procedures to be applied | The Periodic calibration of electronic balance should be conducted by an independent accredited laboratory, and which is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications. The Muffle furnace do not require calibration. |
| Purpose of data | Calculation of baseline emissions |
| Calculation method | N/A |
| Comments | Sampling procedures and method is described in Section 5.3 of JPM. |

| | |
|---|---|
| Data / Parameter | $EC_{PJ,j,y}$ |
| Data unit | MWh |
| Description | Quantity of electricity consumed by the proposed project in year y |
| Source of data | Direct measurement from electricity meter |
| Description of measurement methods and procedures to be applied | Measured by electricity meter. |
| Frequency of monitoring/recording | Continuous measurement and at least monthly recording |
| Value applied | 280 MWh for ex-ante estimation, which sourced from Project evaluation report. During the monitoring period, the Quantity of electricity consumed by the proposed project will be determined as per the electricity meter monitoring and Cross-check with the "monthly production record". |
| Monitoring equipment | electricity meter |
| QA/QC procedures to be applied | The calibration of meter, including the frequency of calibration, should be done in accordance with national standards or requirements. |

| | |
|---|---|
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $EF_{EF,j,y}$ |
| Data unit | $tCO_2/MWh$ |
| Description | Emission factor for electricity generation |
| Source of data | Published by Ministry of Ecology and Environment of China, which is the DNA of China |
| Description of measurement methods and procedures to be applied | This parameter can be obtained from the "Emission Factors of China's Regional Power Grid Baseline for Emission Reduction Projects" published by the Ministry of Ecology and Environment of China, which is the DNA of China. |
| Frequency of monitoring/recording | This value will change once the latest data is published |
| Value applied | 0.50885 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of Data | Calculation of project emission |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $TDL_{j,y}$ |
| Data unit | / |
| Description | Average technical transmission and distribution losses for providing electricity to source *j* in year *y* |
| Source of data | Tool 05" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | According to Tool 05" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" |
| Frequency of monitoring/recording | This value will change once the tool is updated |
| Value applied | 20% |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $FC_{i,j,y}$ |
| Data unit | tonne |
| Description | Quantity of fuel type *i* combusted by the proposed project during the year *y* |
| Source of data | Direct measurement by electronic flowmeter |
| Description of measurement methods and procedures to be applied | Measured by electronic flowmeter |
| Frequency of monitoring/recording | Continuously monitored by electronic flowmeter and at least monthly recording |
| Value applied | Only diesel used for the project. 0 tons for ex ante estimation, which sourced from Project evaluation report. During the monitoring period, the diesel consumption will be recorded in "Diesel usage record" and Cross-check with the "purchase and stock change record". |
| Monitoring equipment | Electronic flowmeter |

| | |
|---|---|
| QA/QC procedures to be applied | Archive electronically during project plus 5 years.<br>The calibration of electronic flowmeter, including the frequency of calibration, should be done in accordance with national standards or requirements. |
| Purpose of data | Calculation of project emissions |
| Calculation method | N/A |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | $NCV_{i,y}$ |
| Data unit | GJ/ton |
| Description | Weighted average net calorific value of fuel type i in year y |
| Source of data | upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC |
| Description of measurement methods and procedures to be applied | Default value of IPCC are applied. Any future revision of the IPCC Guidelines should be taken into account. |
| Frequency of monitoring/recording | This value will change once the latest data can be obtained |
| Value applied | Diesel: 43.3 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of Data | Calculation of project emission |
| Calculation method | N/A |
| Comments | Applicable to Option 1 in the step “Determination of project emissions from fossil fuel consumption ($PE_{FC,y}$)” |

| | |
|---|---|
| Data / Parameter | $EF_{CO2,i,y}$ |
| Data unit | $tCO_2/GJ$ |
| Description | Weighted average $CO_2$ emission factor of fuel type i in year y |

| | |
|---|---|
| Source of data | upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC |
| Description of measurement methods and procedures to be applied | Default value of IPCC are applied. Any future revision of the IPCC Guidelines should be taken into account. |
| Frequency of monitoring/recording | This value will change once the latest data can be obtained |
| Value applied | Diesel: 0.0748 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of Data | Calculation of project emission |
| Comments | Applicable to Option 1 in the step "Determination of project emissions from fossil fuel consumption ($PE_{FC,y}$)" |

| | |
|---|---|
| Data / Parameter | $Q_y$ |
| Data unit | ton |
| Description | Quantity of waste composted in year *y* (t/yr) |
| Source of data | Recorded by project participant |
| Description of measurement methods and procedures to be applied | This parameter can be obtained by sum of the quantity of manure (wet basis) and the total amount of waste disposed in a SWDS. The quantity of manure (wet basis) is measured by electronic truck scale.<br>Total amount of waste disposed in a SWDS measured on wet basis by Belt scale 1 |
| Frequency of monitoring/recording | Continuously |
| Value applied | 133079 tons of waste composted for Ex-ante calculation which is sourced from project evaluation report. |
| Monitoring equipment | Electronic truck scale and Belt scale 1 in project site |

| | |
|---|---|
| QA/QC procedures to be applied | This parameter can be sourced from “monthly production record” recorded by project participant.<br>Archive electronically during project plus 5 years.<br>Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer’s specifications. |
| Purpose of data | Calculation of project emissions |
| Calculation method | This parameter can be obtained by sum of the quantity of manure (wet basis) and the total amount of waste disposed (wet basis) in a SWDS. |
| Comments | N/A |

| | |
|---|---|
| Data / Parameter | The amount of the organic fertilizers generated |
| Data unit | tons |
| Description | The amount of the organic fertilizers generated |
| Source of data | Recorded by project participant |
| Description of measurement methods and procedures to be applied | The amount of the organic fertilizers generated is measured by belt scale 2 in project site. |
| Frequency of monitoring/recording | Continuously |
| Value applied | 130,000 tons of organic fertilizer which is sourced from project evaluation report. |
| Monitoring equipment | Belt scale 2 |
| QA/QC procedures to be applied | This parameter can be sourced from “monthly production record” recorded by project participant.<br>Archive electronically during project plus 5 years.<br>Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer’s specifications. |

| | |
|---|---|
| Purpose of data | To demonstrate the contribution of SDG12 |
| Calculation method | N/A |
| Comments | N/A |

## 5.3 Monitoring Plan

The monitoring plan presented in this JPM assures that real, measurable, long term GHG emission reductions can be monitored, recorded and reported. It is a crucial procedure to identify the final VCUs of the project. This monitoring plan will be implemented by the project owner during the project operation. The details of the monitoring plan are specified as follows:

1. Monitoring framework

The project owner will be responsible for the whole monitoring work. The VCS Monitoring Team will be established to collect and record monitoring data within the project boundary. The VCS monitoring team will be responsible for the normal operation of the manure treatment system and the collection and record of all the monitoring data. All the data will be reviewed by the project developer and VVB. Each member of the VCS monitoring team will be trained by the project owner at least once a year. The overall monitoring system structure of the project shows as below:

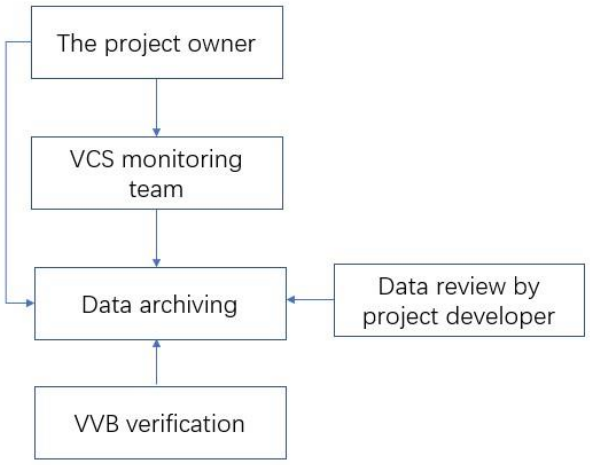



Figure 5-1 The Organization Structure of the Monitoring Team

2. Monitoring equipment and installation

Installation and configuration of monitoring equipment are shown as Figure 5-2. In order to ensure measurements with a low degree of uncertainty, the data monitoring equipment will be calibrated and checked by an appropriately qualified third party according to an appropriate national standard. The calibration records will be appropriately maintained and made available for review by VVB.

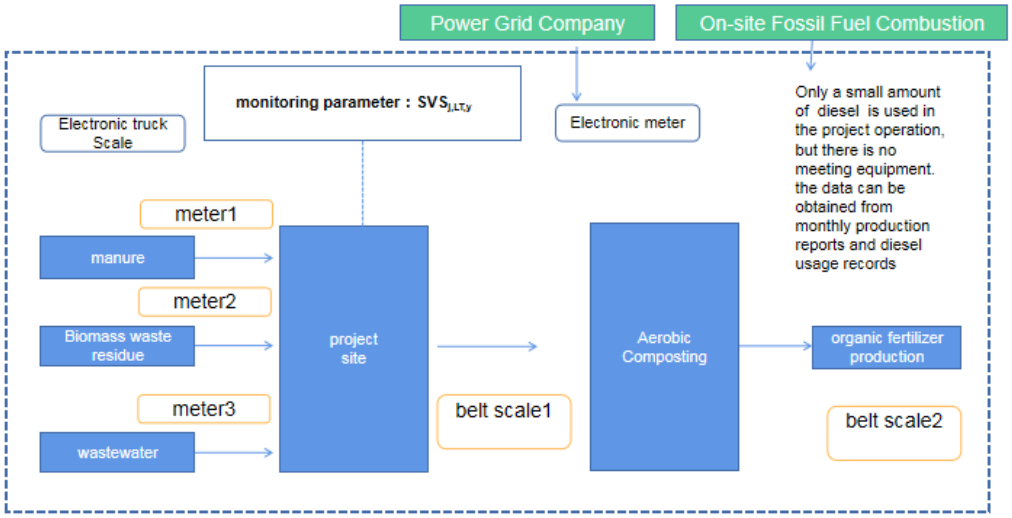



Figure 5-2 Installation and Configuration of Meters

3. Principle of Monitoring

All the data to be monitored in this project has been descripted in section 5.2 in this JPM.

The installation of relevant monitoring instruments and meters shall be carried out in accordance with industry requirements and manufacturer specifications and shall be calibrated regularly as required.

If monitoring instruments is changed or added during the crediting period, this should be documented transparently in the monitoring reports, and the procedure for post registration changes shall be followed.

4. Parameters to be monitored

The monitoring requirements for this methodology include the monitoring of parameters for both baseline and project emissions calculations. All provisions in the methodology and relevant tools shall apply, as described for each parameter in section 5.2 of this JPM.

For this project, the parameters that need to be monitored as the description of section 5.2 are as follows:

a) Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y, $f_y$

b) Total amount of waste disposed in a SWDS in year x, $W_{j,x}$

c) Maximum methane producing potential of the volatile solid generated by animal type LT, $B_{0, LT}$

d) Quantity of manure treated from livestock type LT at animal manure management system j,

$Q_{manure,LT,y}$

e) Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y, $SVS_{j,LT,y}$

f) Quantity of electricity consumed by the proposed project in year y, $EC_{PJ,j,y}$

g) Emission factor for electricity generation, $EF_{EF,j,y}$

h) Average technical transmission and distribution losses for providing electricity to source j in

year y, $TDL_{j,y}$

i) Quantity of fuel type i combusted by the proposed project during the year y, $FC_{i,j,y}$

j) Weighted average net calorific value of fuel type i in year y, $NCV_{i,y}$

k) Weighted average $CO_2$ emission factor of fuel type i in year y, $EF_{CO2,i,y}$

l) Quantity of waste composted in year y (t/yr), $Q_y$

m) The amount of the organic fertilizers generated.

For the fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere, this parameter can be determined by the existing laws and regulations.

Total amount of waste disposed in a SWDS was measured by Belt scale 1 and the data can be sourced from the "Biomass treatment daily record" recorded by project participant.

For $B_{0,LT}$, a default value from IPCC 2006 is applied, therefore it is not monitored during the operation period.

Quantity of manure (dry base) treated from livestock type LT at animal manure management system can be calculated by the Quantity of manure (wet base) multiply (1- moisture content of manure (wet basis)). The Quantity of manure (wet base) measured by electronic truck scale; the moisture content of manure (wet basis) can be measured by electronic balance and Electric heating blast drying oven as per GB/T25169 Technical specifications for monitoring of animal manure.

For $SVS_{j,LT,y}$, this parameter was determined according to the guideline in annex 2 of AM0073. This parameter can be sourced from "Volatile Solids Test Record".

The quantity of electricity consumed by the proposed project was measured by electricity meter, the data can be sourced from the "Electricity consumption daily record" and cross-checked by the "monthly production record".

The value of $EF_{EF,j,y}$ is sourced from the "Emission Factors of China's Regional Power Grid Baseline for Emission Reduction Projects" published by the Ministry of Ecology and Environment of China, which is the DNA of China, therefore it is not monitored during the monitoring period. This value will be updated according to the latest published document.

Average technical transmission and distribution losses for providing electricity to source j is sourced from the tool 05" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" and will be updated once the tool is updated.

For Quantity of fuel type i combusted by the proposed project during the year y was measured by electronic flowmeter and recorded in "Diesel usage record", so the data can be sourced from "Diesel usage record" and cross-checked by "purchase and stock change record".

For $NCV_{i,y}$ and $EF_{CO2,I,y}$, the source of data applied the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC, therefore it is not to be monitored during the monitoring period. This value will be updated once the IPCC is updated.

For the Quantity of waste composted in year y, the value can be calculated by adding the total amount of waste disposed in a SWDS and the Quantity of manure (wet base) treated. This data can be sourced from "monthly production record".

For the amount of the organic fertilizers generated can be measured by Belt scale 2 and the data can be sourced from "monthly production record".

5. Quality control and quality assurance procedures

A quality management system will be established, which ensures the quality and accuracy of the measured data. Training

For all members involved in the project, necessary trainings will be provided by the project owner. Besides, the project owner should ensure that only skilled employees are allowed to undertake the monitoring work. The training contents should be regard to the general and technical aspects of the project to the extent appropriate, as well as basic understandings of VCS Standard and climate change.

Data management

All data collected as part of monitoring plan should be saved with at least 1 backup copy until the end of the crediting period. After the crediting period ends, the data should be archived electronically on hard disks and be kept at least 2 years after the end of the last crediting period. Corrective actions

The project signs an agreement that it is not participate in other environment credits, other GHG programs and has not been rejected by any other GHG Programs. The whole VCS monitoring team follow recognized standard data evaluation methods to guarantee that the

data is reliable and accurate. The quality control and quality assurance procedures include the handling and correction of nonconformities in the implementation of the project or the monitoring plan. In case such nonconformities are observed:

- An analysis of the nonconformity and its causes should be carried out immediately by the project owner, with the help of external experts if necessary.

- A corrective action plan should then be developed to eliminate the non-conformity and its causes to prevent its recurrence.

- Corrective actions are implemented and reported back to the VCS monitoring team.

- Relative information should be included in the monitoring report and reported to VVB during the verification.

If the data record is missing or damaged during the monitoring periods, the following makeup process should be conducted:

-The general principle is that Conservative value will be used for the missing or damaged data. This is most conservative approach. The monitoring personnel will be trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle. During the monitoring process, the monitoring personnel will be required to strictly abide by the above conservative principle in data recording, i.e., use Conservative value for all the missing or damaged data.

-If this is due to the working error of the monitoring personnel, further train the person until he or she can perform the job properly. And in the meantime, use Conservative value for the missing or damaged data;

-If this is due to the inability or attitude of a particular worker in monitoring team, dismiss such worker and re-hire those with proper ability and attitude. And in the meantime, use Conservative value for the missing or damaged data;

-If some data recorded are significantly higher than the normal range, the monitoring personnel should ask for the reason. If the measurement is high due to the damage of measurement equipment, Conservative value is used for that day's data. And need to calibrate and maintain the measuring equipment immediately and avoid this situation in the future.

If the monitoring results are satisfactory in terms of correct reporting, data completeness and correct analysis, the data is accepted for the monitoring report.

6. Sample plan

The sampling objective

To determining the specific volatile solids content of Swine manure ($SVS_{j,LT,y}$) during the crediting period with a 90/10 confidence/precision.

The determination of sampling sizes

According to the methodology AMS-III.D (Version 21.0)", PP shall use 90/10 confidence/precision as the criteria for the reliability of sampling efforts for large-scale project.

According to the CDM guideline "Sampling and surveys for CDM project activities and programs of activities" (Version 04.0), the sample size can be calculated by the following equation:

$$n = (\frac{t_{n-1} \times CV}{0.1})^2$$

n = Sample size

$t_{n-1}$ = the value of the t-distribution for 90% confidence when the sample size is n, i.e.,1.645

CV = The coefficient of variation. 2% was used as per the public literature

So, the sample size n is rounded to an integer as 1. Also, as per the methodology AMS-III.D (Version 21.0), the Monitoring frequency of this parameter is annually, so during the monitoring period, the value of SVS will be measured once annually, and in order to ensure the accuracy and rationality of the data, three parallel samples will be taken during the measurement, so the sample size is 3.

Testing method

As per methodology AMS-III.D, the testing shall be performed according to the guideline in annex 2 of AM0073. The details as follows:

1 - Evaporate free water on steam able and dry in oven at 103°C for 24 hours or until constant weight to obtain the Total Solids.

2 - Place Total Solids residue in furnace at 600ºC for at least 1 hour. Volatile Solids are determined from weight difference of total and Fixed Solids.

$$volatile\ matter(drybasis) = \frac{W2 - Wf}{W2 - W1}$$

Where $W_1$ is the weight of sample container, $W_2$ is combined weight of the sample container and oven dried sample, $W_f$ is the combined constant weight of the sample container and sample after heating at 600ºC.

Procedures for Administering Data Collection and Minimizing Non-sampling Errors

During the yearly monitoring activities, the Specific volatile solids content of Swine manure was recorded in the" Volatile Solids Test Record". Then average Specific volatile solids content in

the three parallel samples will be used in the calculation of emission reductions. The data will be reviewed by the project developer and VVB.

If the recorded raw data on the "Volatile Solids Test Record" are reasonable and basically consistent with the actual proportion of each component in Swine manure, the raw data is archived.

If the data record is missing or damaged during the monitoring periods, the following makeup process should be conducted:

1) The general principle is that conservative value sourced from the publicly available information is used for the missing or damaged data. This is most conservative approach. The monitoring personnel are trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle. During the monitoring process, the monitoring personnel are required to strictly abide by the above conservative principle in data recording, i.e., use conservative value sourced from the publicly available information for all the missing or damaged data.

2) If this is due to the working error of the monitoring personnel, further train the person until he or she can perform the job properly. And in the meantime, use conservative value sourced from the publicly available information for the missing or damaged data;

3) If this is due to the inability or attitude of a particular worker in monitoring team, dismiss such worker and re-hire those with proper ability and attitude. And in the meantime, use conservative value sourced from the publicly available information for the missing or damaged data;

4) If some data recorded are significantly higher than the normal range, the monitoring personnel should ask for the reason. If the measurement is high due to the damage of weighing scales or other measurement equipment, the data needs to be remeasured. And need to calibrate and maintain the weighing scale or replace the measuring equipment immediately and avoid this situation in the future.

If the monitoring results are satisfactory in terms of correct reporting, data completeness and correct analysis, the data is accepted for the monitoring report.

QA/QC Procedures

Before implementing the project, the project owner train the personnel of monitoring teams on how to properly conduct the monitoring process.

If the data reported by the team member significantly deviates from the normal range, the monitoring personnel should write down the reasons and report to the team leader, any action is forbidden before the permission. The monitoring team arrange research according to the attached form. At the same time, when the verification group has any doubt with the right result, they can arrange related research.

The project owner should enter all the measured data into the data sheet, using Excel to calculate the mean value of Specific volatile solids content of Swine manure in the three parallel sample, compared with the publicly available data.