HENGYANG PEIKE ANIMAL MANURE COMPOSTING PROJECT

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Hengyang Peike Animal Manure Composting Project (hereafter referred to as the project) is a centralized manure treatment plant established in Hengyang County using aerobic composting system. The project collects and composts swine, chicken, and duck manure produced by livestock farms in Hengyang County to produce organic fertilizer. The Project is developed by Hengyang Peike Ecological Technology Co., Ltd. (hereinafter referred to as "the project proponent"). The Project is located at Quantang Group, Shiyou Village, Yanpi Town, Hengyang County, Hengyang City, Hunan province, People's Republic of China. The purpose of the project activity is to avoid methane emissions through controlled aerobic treatment by composting swine, chicken, and duck manure.

The baseline scenario is the situation where, in the absence of the project activity, manure is left to decay in anaerobic manure management system (uncovered open lagoon) at the livestock farms, and methane was emitted to the atmosphere directly without any methane recovery and destruction facility. In China, the uncovered anaerobic lagoons are a manure treatment method recognized by the state. In addition, since there is no legal regulation to mandate the farm owners to implement anaerobic digestion, aerobic or other biological treatment techniques and to capture and/or utilize methane generated at these lagoons, therefore the continue of this common practice to treatment the manure i.e., uncovered anaerobic lagoons is the most economic, viable and reasonable for livestock farm owners.

The project introduces the aerobic composting system that is designed to treat swine, chicken, and duck manure from livestock farms in Hengyang County to produce organic fertilizer. The project comprises of pretreatment system, composting system, and fertilizer packaging system. It is estimated that approximately 50,000 tonnes of manure can be treated annually, and the annual organic fertilizer production is 30,000 tonnes. Part of the organic fertilizer will be sold to nearby farmers and most of it will be sold to local businesses.

It is estimated that during the 7-year project crediting period (from 03-Jan-2022 to 02-Jan-2029), the total GHG emission reductions will be 414,988 tCO_2e, with annual emission reductions of 59,284 tCO_2e.

1.2 Sectoral Scope and Project Type

The project falls into sectoral scope 13: Waste handling and disposal.

The project is not AFOLU project and is not a grouped project.

1.3 Project Eligibility

The scope of the VCS Program includes:

1) The seven Kyoto Protocol greenhouse gases: The project reduces CH_4 emissions, and CH_4 is a Kyoto Protocol greenhouse gas.

2) Ozone-depleting substances: NA

3) Project activities supported by a methodology approved under the VCS Program through the methodology approval process: NA

4) Project activities supported by a methodology approved under a VCS approved GHG program unless explicitly excluded under the terms of Verra approval: The methodology AMS-III.F: Avoidance of methane emissions through composting (version 12.0) of the project utilized is a methodology approved under CDM Program, which is a VCS approved GHG program.

5) Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements: NA

The project does not belong to projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal, or destruction.

Meanwhile, the Project does not fall into any project type shown in Table 1 (Excluded Project Activities) of *VCS Standard 4.4*.

Therefore, the Project is eligible under the scope of VCS program.

1.4 Project Design

☒ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☐ The project is a grouped project

Eligibility Criteria

Not applicable as the project has been designed to be a single installation of an activity, not a grouped project.

1.5 Project Proponent

Organization name	Hengyang Peike Ecological Technology Co., Ltd.
Contact person	YE Hong
Title	Chairman Assistant

Address	Shiyou Village, Yanpi Town, Hengyang County, Hengyang City, Hunan province, China.
Telephone	+86 -2123019950
Email	3542346576@qq.com

1.6 Other Entities Involved in the Project

Organization name	Climate Bridge (Shanghai) Ltd.
Role in the project	Consultant
Contact person	GAO Zhiwen
Title	General Manager
Address	Block B, Level 24, Jiangong Mansion, 33 Fushan Road, Pudong New Area, Shanghai, China
Telephone	+86 021-62462036
Email	projects@climatebridge.com

1.7 Ownership

The ownership of Hengyang Peike Ecological Technology Co., Ltd. over the Project arises under the project approval issued by a competent authority in compliance with laws; the ownership also arises by virtue of property rights in the plant and equipment that generate GHG emission reductions, as shown in Table 1.1.

Table 1.1 Evidence establishing project ownership accorded to the project proponent.

Evidence types of project ownership	Condition of the Project and the project proponent
1) Project ownership arising or granted under statute, regulation or decree by a competent authority.	The project proponent has obtained the approval from the Development and Reform Bureau of Hengyang County, for the construction and operation of the Project. The Development and Reform Bureau is a competent authority, and the approval demonstrates that the project proponent has been granted the project ownership in compliance with relevant laws and regulations in China.
2) Project ownership arising under law.	

3) Project ownership arising by virtue of a statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership).	The project proponent has signed equipment purchase contracts with suppliers and signed the construction contract with contractor. Therefore, the project proponent has property rights in the plant and its equipment that generate GHG emission reductions.

1.8 Project Start Date

The project start date is 03-Jan-2022 when the plant started producing the organic fertilizer.

1.9 Project Crediting Period

The Project adopts a 7-year renewable crediting period crediting period from 03-Jan-2022 to 02-Jan-2029 (both days included).

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☒ 20,000 – 100,000 tCO_2e/year

☐ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	✔
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
03-Jan-2022 to 31-Dec-2022	58,959
01-Jan-2023 to 31-Dec-2023	59,284
01-Jan-2024 to 31-Dec-2024	59,284
01-Jan-2025 to 31-Dec-2025	59,284

01-Jan-2026 to 31-Dec-2026	59,284
01-Jan-2027 to 31-Dec-2027	59,284
01-Jan-2028 to 31-Dec-2028	59,284
01-Jan-2029 to 02-Jan-2029	325
Total estimated ERs	414,988
Total number of crediting years	7
Average annual ERs	59,284

1.11 Description of the Project Activity

This project introduces aerobic composting technology, which follows a step-by-step method as below:

1.Pre-treatment:

The manure to be collected from the livestock farms are treated through a solid-liquid separation system to remove excess water. After that, they are collected and transported to the centralized animal nature management system, and initially mixed with auxiliary materials such as fermentation strains.

2.Main composting:

The pre-treated manure after the solid-liquid separation system is delivered to the composting grooves of the composting workshop. And the pre-treated manure is treated by the Compost Turner Equipment to compost in the composting groove. The Compost Turner Equipment can flip the composting material and keep the ideal aerobic composting temperature. Every time it is turned, the bacteria in the organic material obtain sufficient oxygen, which is easy to compost, and at the same time, it also helps uniform the temperature of the organic material. The ventilation pipe is installed in the composting groove, which can provide sufficient oxygen for aerobic composting and adjustment of composting temperature.

3.Secondary composting:

After the main composting is completed, the organic fertilizer is removed from the composting groove to secondary composting. In this step, the organic fertilizer discharged from composting grooves is flipped for further composting until the organic fertilizer is stable at room temperature.

4.Packaging:

The organic fertilizer produced by secondary composting undergoes a series of processes such as crushing, granulation, drying, cooling, and screening, and is then packed into bags of different weights and then sold.

Table 1.2 Main Equipment Parameter

Parameter	Value	Unit
Compost Turner Equipment		
Model	LXF-4000	-
Number	2	-
Total Power	27.5	kW
Granulators		
Model	FHZL-1.6*60	-
Number	1	-
Total Power	37	kW
Model	YPZL-3.0	-
Number	1	-
Total Power	11	kW

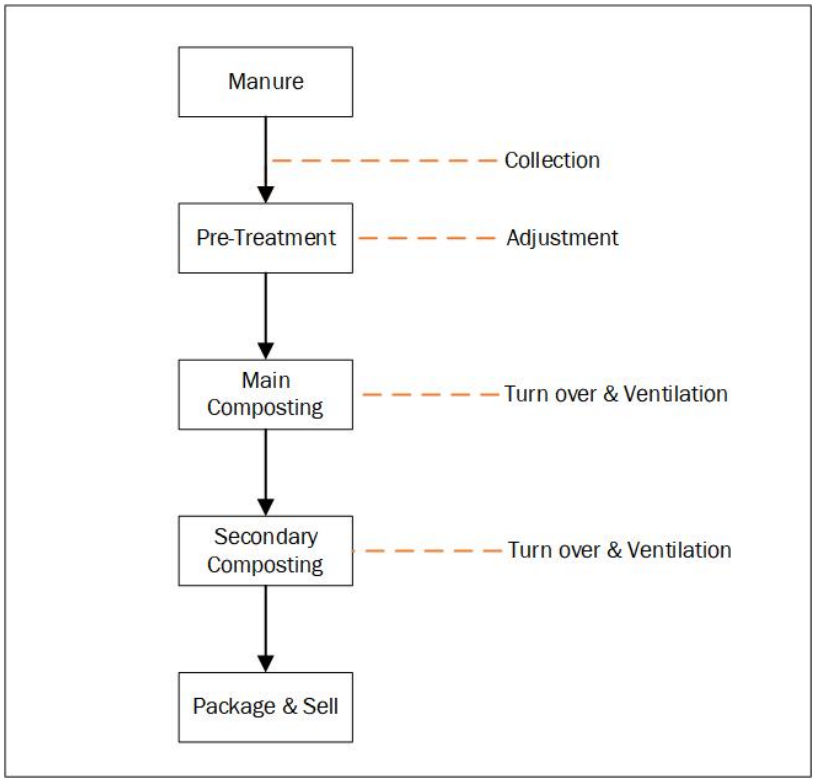


Figure 1.1 Process flow diagram of the project activity

1.12 Project Location

The Project is located in Shiyou Village, Yanpi Town, Hengyang County, Hengyang City, Hunan province, People's Republic of China. The coordinates of the project site are E 112°15'43", N 27°04'13".

The project location is shown in Figure 1.2.

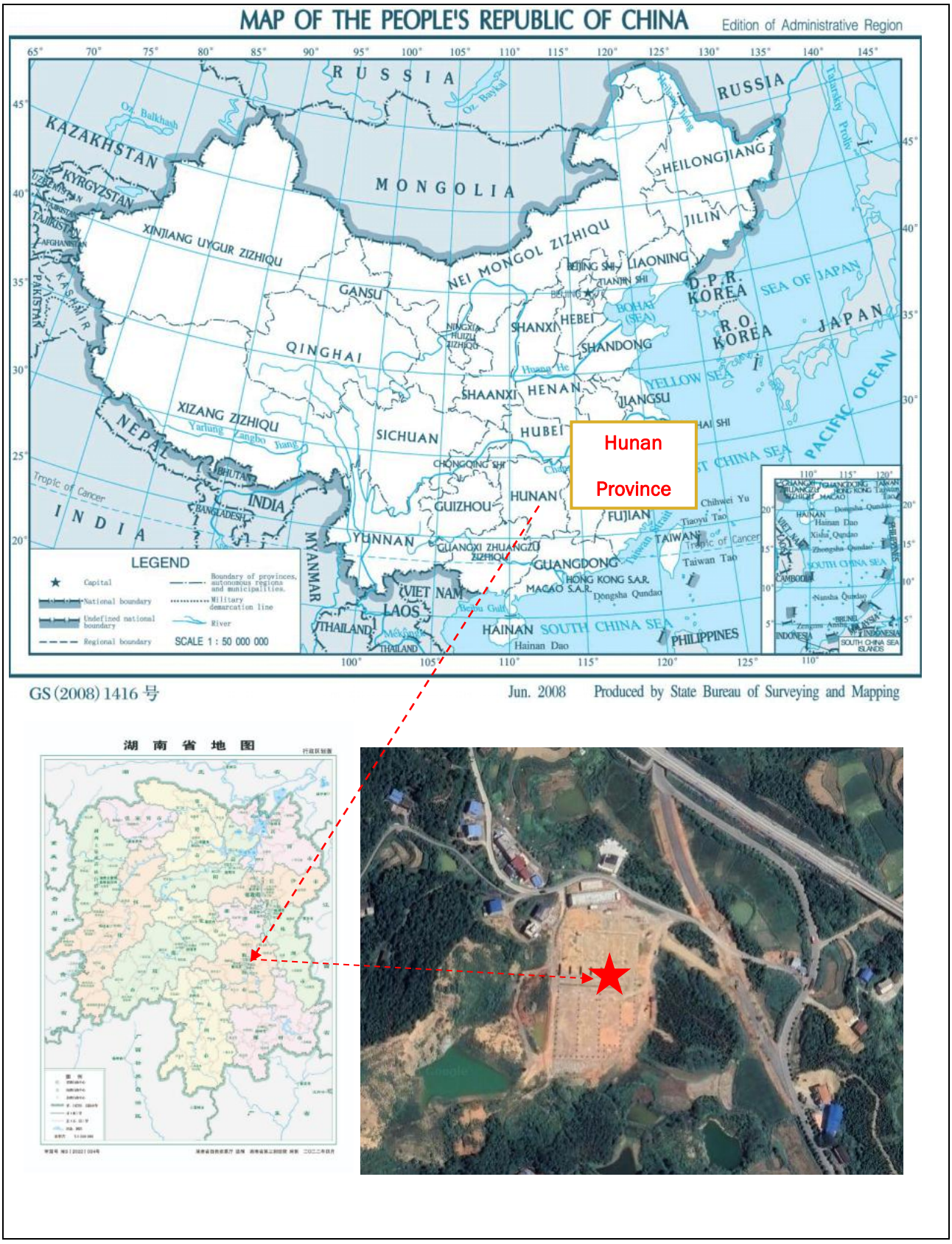


Figure 1.2 Location of the project

1.13 Conditions Prior to Project Initiation

The baseline scenario is the same as the condition existing prior to the project initiation. Refer section 3.4 of the PD for detailed baseline scenario.

For the proposed project, swine, chicken, and duck manure are used for composting. In absence 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.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project complies with all Chinese relevant laws and regulations, as shown in Table 1.2.

Table 1.3 Compliance with relevant laws and regulations

Laws and regulations	The Project
Regulations on the Approval and Recordation of Enterprise Investment Projects, Administrative Measures on the Approval and Recordation of Enterprise Investment Projects, which sets out the procedures of project approval and recordation.	The Project has obtained the approval and has been recorded by the Development and Reform Bureau of Hengyang County, in compliance with the regulation and the administrative measure.
Law of People's Republic of China on Environmental Impact Assessment, which sets out the requirements on the completion and approval of the environmental impact assessment (EIA) report/form of construction projects.	The (EIA) form of the Project has been completed and then approved by the Hengyang County Branch of Hengyang Ecology and Environment Bureau, which is in compliance with the provisions in the law.
Construction Law of the People's Republic of China, which sets out the requirements on application and approval of the construction permit prior to the project construction.	The Project obtained the construction permit prior to the construction in compliance with the provisions in the law.
Catalogue for the Guidance of Industrial Structure Adjustment, which lists projects in three categories: encouragement category, restriction category and elimination category.	The Project is a composting of livestock and poultry manure project and belongs to the encouragement category of the Catalogue.

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 has not been rejected by any GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

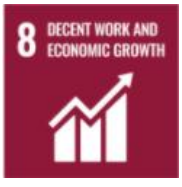
The project hasn't sought or received another form of environmental credit.

Supply Chain (Scope 3) Emissions

As per *Clarification to VCS Program Rules and Requirements* issued on 31-May-2023, projects are not required to complete the sections in the affected VCS project templates that relate to Scope 3 emissions double claiming until the effective date of the revised requirements of 01-Jan-2024. Therefore, this section is not required in this PD.

1.17 Sustainable Development Contributions

The project will contribute to sustainable development in the following ways:

	The construction and operation of the project will provide 12 employment positions for local villagers and increase tax revenue, which will have a positive effect on the local economy. During the first crediting period, direct and indirect employment opportunities will be generated. Thus, the project will achieve SDG 8 Decent Work and Economic Growth[1]. This contributes to one of the China's actions for promoting sustainable developing, "Increase labor force participation rate through

[1] https://sdgs.un.org/goals/goal8

	implementation of the classification policy. Vigorously enforce the Law on Promotion of Employment".
	The project introduces the aerobic composting system that is designed to treat swine, chicken, and duck manure from the livestock farms to produce organic fertilizer. It is estimated that approximately 50,000 tonnes of manure can be treated annually, and the annual organic fertilizer production is 30,000 tonnes. Thus, the project will achieve Target 12.5 of SDG 12 Ensure sustainable consumption and production patterns[2].This contributes to achieve one of China's stated sustainable development priorities "Promote circular production methods, promote green design and clean production, improve waste materials' recycling network, and enhance renewable resource recycling capacity. Promote the formulation and revision of relevant standards and specifications for the identification of solid and hazardous waste, promote waste classification, comprehensive utilization of industrial solid waste, and recycling and disposal of agricultural waste, and promote the high-quality development of the domestic renewable resource industry. Deepen the pilot reform and innovation of "zero-waste city" construction and play a leading role in the demonstration".
	The project will avoid GHG emissions by treating animal manure that would be left to decay within the livestock farms and methane is emitted to the atmosphere without the project activity. Thus, the project can reduce CH_4 emissions more effectively and can contribute to the mitigation of global climate warming. Besides, the project provides opportunities for local residents to learn and raise awareness on climate change and mitigation measures on the stakeholder consultation fiscal meeting. The project will achieve a GHG emission reduction of 59,284 tCO_2e/yr during the first crediting period. Thus, the project will achieve SDG 13 Climate Action[3]. This contributes to achieve one of China's stated sustainable development priorities "Actively adapt to climate change and strengthen resistance capacity to climate risks in agriculture, forestry, water resources and other key fields, as well as cities, coastal regions and ecologically vulnerable areas".

1.18 Additional Information Relevant to the Project

[2] https://sdgs.un.org/goals/goal12

[3] https://sdgs.un.org/goals/goal13

Leakage Management

Not applicable. The project is greenfield project and all equipment applied is new, it does not involve the equipment transferred from another activity or if the existing equipment is transferred to another activity as per section 5.5 of the methodology. And the compost won't be subjected to anaerobic storage, not disposed of in an SWDS. Therefore, leakage emission is not taken into account for the project activity.

Commercially Sensitive Information

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

Further Information

No additional relevant legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and/or temporal information that may have a bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

2 SAFEGUARDS

2.1 No Net Harm

Environmental impacts

The Environmental Impact Assessment (EIA) form for the Project has been completed by a third-party company and approved by the Hengyang County Branch of Hengyang Ecology and Environment Bureau, with approval Zheng Huan Ping Han No. (2020) No. 03. Every aspect of environmental impacts has been considered and discussed in the EIA form; with necessary mitigation measures taken, there are no negative environmental impacts due to the Project. The detail information about the environmental impact will be discuss in section 2.3.

Socio-economic impacts

During the construction and operation of this project, the project provides employment opportunities for local residents. Therefore, the project plays an important role in the local social and economic development.

In conclusion, the project has no negative impacts on local environment. No net harm on local environment and social community has been detected for the project.

2.2 Local Stakeholder Consultation

The project owner collected comments from local stakeholders about the project activity. Survey questionnaires were distributed to local residents and government officials by the project owner in January 2021.

The survey questionnaire was designed to assess the project's impacts on the local environment and social economic development. The structure of the survey respondents is listed in Table 2.1 below.

Table 2.1: Structure of stakeholder survey for the project

Item \ Distribution		Quantity	Percentage
Amount of stakeholders surveyed	Male	20	50%
	Female	20	50%
Age	<25	4	10%
	25-55	18	45%
	>55	18	45%
Education	Junior high school or below	22	55%
	Senior high school	16	40%
	College or above	2	5%
Occupation	Worker	12	30%
	Peasant	16	40%
	Management personnel	2	5%
	Civil servant	4	10%
	Unspecified	6	15%

The 40 questionnaires were distributed to local stakeholders, and all questionnaires have been recollected. Comments from these questionnaires are summarized in Table 2.2 below:

Table 2.2: Summary of stakeholders' comments on the project

No.	Questions	Attitude or Opinion	Amount	Percentage
1	Do you know about the project activity?	Very much	20	50%
		Heard of	10	25%
		Nothing	10	25%
2	Do you think the project will improve the soil condition of cultivated land?	Yes	24	60%
		No	10	25%
		Don't know	6	15%
3	Do you think the project will improve the local employment	Yes	24	60%
		No	0	0

	situation?	Don't know	16	40%
4	Do you think the project will improve the local social community?	Yes	30	75%
		No	0	0
		Don't know	10	25%
5	What is the most probable environmental impact do you think the project will cause after the construction finish? (Multiple choice)	None	38	95%
		Air pollution	0	0
		Water pollution	0	0
		Noise pollution	0	0
		Harm to land	0	0
		Don't know	2	5%
6	What is your attitude to the project activity?	Support	38	95%
		Against	0	0
		Indifferent	2	5%

In general, local stakeholders are supportive of the project construction and operation. The survey shows that a majority of local stakeholders think the project will help improve the life of local people without much adverse environmental impact. The survey shows that almost the stakeholders are supportive to the proposed project, believing that the project will provide more employment opportunities and will improve villagers' income. Therefore, the implementation of the project is regarded as beneficial by most of the local stakeholders.

During the project implementation, local stakeholders' opinions are collected through two channels available: regular questionnaire surveys conducted by the project proponent which take place every year, communications between local residents and authorities. The project proponent informs the local authorities of key implementation events or changes of the Project, then the local authorities inform the residents living around the project sites, and the comments and suggestions from residents are collected by the local authorities; the local government agencies also conduct spot checks on the project implementation on a regular basis and give suggestions on potential issues.

2.3 Environmental Impact

The project proponent entrusted a third party, Hunan Zhenxin Environmental Protection Technology Co., Ltd., to conduct the Environmental Impact Assessment (EIA) on the Project. The EIA report of the project was approved by the Hengyang County Branch of Hengyang Ecology and Environment Bureau on 27-Feb-2020. The environmental impacts of the project are summarized as follows.

Air pollution

The waste gas during the operation period of this project mainly includes foul odor, unorganized dust, organized dust, and vehicle exhaust. The project adopts a combination of manual spraying of deodorant and the establishment of a deodorant spray system to suppress odor to

comply with the national standard *Emission Standards for Odor Pollutants* (GB14554-93). Organized dust is treated to comply with the national standard *Integrated Emission Standard of Air Pollutants* (GB16297-1996) by setting up two sets of bag dust collectors and one 15-meter-high exhaust pipe. Unorganized emissions are reduced through workshop barriers to comply with the national standard *Integrated Emission Standard of Air Pollutants* (GB16297-1996).

Wastewater

The production water generated during the project operation period mainly consists of water for deodorants and chemicals, which enters the product and partially evaporates without being discharged. The small amount of leachate generated during the fermentation process flows into the leachate collection tank through the groove and is then sprayed back onto the stack with lower water content to regulate water content, heated and evaporated by fermentation, and not discharged.

Noise

The noise during the operation of this project mainly comes from the noise generated by mixers, crushers, stackers, and granulators, and the sound source intensity meets the national standard *Emission Standard for Industry Enterprise Noise at Boundary (GB 12348-2008)*.

Solid waste

The solid waste generated during the operation of the project is mainly dust collected by bag type dust collector The dust collected by the bag filter is reused for production to prepare Manure.

In conclusion, the environmental impact during the project operation will be minor. The project activity can reduce greenhouse gas emission and environmental pollution caused by methane release. The project owner takes appropriate measures to minimize adverse environmental impacts.

2.4 Public Comments

The 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

The project is not an AFOLU project. Thus, this section is not applicable to the project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The following methodology is applicable to the project activity.

AMS-III.F Avoidance of methane emissions through composting (Version 12.0)

https://cdm.unfccc.int/methodologies/DB/NZ83KB7YHBIA7HL2U1PCNAOCHPUQYX

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

For the baseline manure emissions, AMS-III.F (Version 12.0) refers to "AMS-III.D: Methane recovery in animal manure management systems" (Version 21.0):

https://cdm.unfccc.int/methodologies/DB/H9DVSB24O7GEZQYLYNWUX23YS6G4RC

Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

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

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-13-v2.pdf

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

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf

3.2 Applicability of Methodology

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

Table 3.1 Applicability of AMS-III.F

AMS-III.F Avoidance of methane emissions through composting (Version 12.0)		
NO.	Eligibility Criteria	Justification for the Project Activity
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.	Applicable In the project activity, an aerobic composting system is newly built to treat the swine, chicken, and duck manure from livestock farms in Hengyang County.
2	This methodology includes construction and expansion of	Not relevant.

	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.	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.	Not relevant. The project does not involve co-composting wastewater and solid biomass waste.
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.	Not relevant. The project activity does not involve co-composting
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.	Applicable The location and characteristics of the disposal site of the animal manure in the baseline condition are well known. In the baseline condition, all manure would be left to decay within the livestock farms and methane is emitted to the atmosphere.

		The estimation of manure methane emissions can use AMS-III.D.
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.	Applicable The treatment process of this project includes adding straw during the composting process, which will not be used for emission reduction calculations. For this project, swine, chicken, and duck manure are used for composting, therefore it meets the requirements under paragraphs 3 and 4(c) of the latest versions of AMS-III.D, please see text below at the end of this table).
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 project activity for the duration of the crediting period; b. Establish that it is common practice in the region to dispose of the waste in solid waste disposal site (landfill)/stockpile(s).	Not relevant. In the project activity, an aerobic composting system is newly built to treat the swine, chicken, and duck manure collected from livestock farms in Hengyang County. Thus, the project does not involve the solid wastes diverted from a solid waste disposal site.
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	Not relevant. The project does not

	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).	involve the solid wastes diverted from a solid waste disposal site, so there is no need to clearly define the geographical boundary of the region referred in paragraph 11(b).
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.	Applicable 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.	Not relevant. 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	Not relevant.

	residual organic content shall 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 Applicable 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 21.0), as below:

Paragraphs 3

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

The swine, chickens, and ducks in livestock farms are managed under confined conditions.

(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;

The swine, chicken, and duck manure are prohibited to discharge into any natural water resources without treatment according to *Discharge Standard of Pollutants for Livestock and Poulty Breeding (GB18596-2001)*. According to the EIA, the swine, chicken, and duck manure are treated in the composting workshop and won't discharge into natural water resources.

(c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5 ^{0}C;

The annual average ambient temperature at the site is 17.9 ^{0}C, which is higher than 5 ^{0}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 60 days in the baseline scenario in accordance with the *Regulations on Pollution Prevention*

and Control of Livestock and Poultry Scale Farming in Hunan Province[4] and *Technical Guidelines for the Construction of Manure Treatment Facilities in Livestock and Poultry Farms (Households)*[5]. 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 *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.

In the project activity, as the aerobic composting system and all the livestock farms are in Hengyang County, so the manure wastes can be collected directly from the feedlots and transported to the composting system regularly. Therefore, the storage time of the manure does not exceed 45 days.

Table 3.2: Applicability of applied tools

Tool 05:" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)		
NO.	Eligibility Criteria	Justification for the Project Activity
1	If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power	Applicable. The project will use electricity from local power grid connected to Central China Power Grid (CCPG), which falls under scenario A of Tool 05 (Version 03.0). Therefore, the project emissions from electricity consumption need to be calculated.

[4] http://www.hunan.gov.cn/hnszf/xxgk/wjk/szfbgt/202209/t20220909_28733974.html

[5] http://www.moa.gov.cn/govpublic/xmsyj/202208/t20220823_6407515.htm

	plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer. (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (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	
2	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: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the	Not relevant. This methodological tool is applied for calculating for emission by electricity consumption in project activity. So, this criterion is not relevant.

	grid and consumers/electricity consuming facilities	
3	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 CO_2 emissions.	Not relevant. No captive renewable power generation technologies will be installed to provide electricity in the Project. This criterion is not relevant.
Tool 13: "Project and leakage emissions from composting" (Version 02.0)		
NO.	Eligibility Criteria	Justification for the Project Activity
1	Typical applications of the tool include projects composting municipal solid wastes, agricultural wastes and digestate.	Applicable. In the project activity, an aerobic composting system is newly built to treat the swine, chicken, and duck manure from livestock farms in Hengyang County.
2	The following sources of project emissions are accounted for in this tool: a. CH_4 and N_2O emission from composting; b. CO_2 emissions from consumption of fossil fuels and electricity associated with composting; and c. CH_4 emissions from run-off wastewater associated with co-composting.	Applicable. a) CH_4 and N_2O emission from composting are accounted. b) CO_2 emissions from consumption of fossil fuels and electricity associated with composting are accounted. c) This project is not involving co-composting. Therefore, no CH_4 emissions from run-off wastewater is generated.
3	The following source of leakage emissions is accounted for in this tool: (a) CH_4 emissions from the anaerobic decay of the residual organic content of compost disposed of in a landfill or subjected to anaerobic storage.	Not relevant. The compost and waste are stored in aerobic condition, not anaerobic condition. Therefore, the project does not involve the leakage.

4	Transport emissions are not accounted for in this tool because it is assumed that similar transportation activities would occur in the baseline.	Applicable. Transport emissions are not accounted.
Tool 21: "Demonstration of additionality of small scale project activities" (Version 13.1)		
NO.	Eligibility Criteria	Justification for the Project Activity
1	This methodological tool provides a general framework for demonstrating and assessing additionality and is applicable to a wide range of project types.	Applicable. The proposed project is designed to treat the swine, chicken, and duck manure to produce the organic fertilizers through aerobic composting. The applied methodology is AMS-III.F, as per applied methodology, the demonstration of additionality should apply this tool.
2	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.	Applicable. Project participants will provide all the data, rationales, assumptions, justifications, and documentation to DOE to support the demonstration of additionality in validating the application of this methodological tool, and the elements checked during this assessment and the conclusions will be documented transparently in the validation report.
3	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.	Not relevant. Project participants will not proposing new methodologies and will not propose alternative methods to demonstrate additionality. Project participants will use this tool to demonstration the additional of the proposed project.
4	Project participants and	Not relevant.

	coordinating/managing entities may also apply "TOOL19: Demonstration of additionality of microscale project activities" as applicable.	The project is a small-scale project, not a microscale project. Therefore, Tool 19 cannot 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, which is shown as the table 3.3:

Table 3.3 The project boundary identification

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, chicken, and duck manure for composting. All manure waste produced was left to decay in uncovered anaerobic lagoons 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.	Not relevant The project does not involve co-composting wastewater.
c	Where the treatment of biomass through composting takes place.	Included Composting system.
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 shown as Figure 3.1 below.

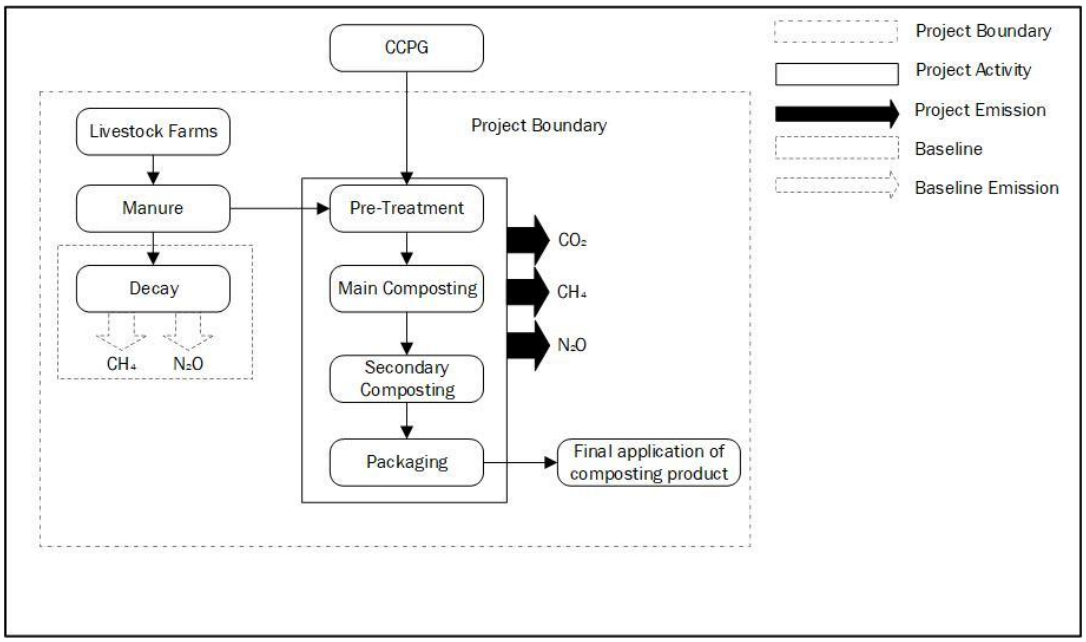


Figure 3.1 The project activity boundary

The greenhouse gases included or excluded from the project boundary are summarized below.

Source		Gas	Included?	Justification/Explanation
Baseline	Manure left to decay within the livestock farms	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	Minor source. Neglected for simplicity and conservativeness
Project	Electricity used for the aerobic composting system	CO_2	Yes	Can be a significant emission source
		CH_4	No	Minor source
		N_2O	No	Minor source
	Fossil fuel used for the aerobic composting system	CO_2	Yes	Can be a significant emission source
		CH_4	No	Minor source
		N_2O	No	Minor source
	Emissions from the composting	CO_2	No	Minor source
		CH_4	Yes	Can be a significant emission source

Source		Gas	Included?	Justification/Explanation
	process	N_2O	Yes	Can be a significant emission source

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 project, swine, chicken, and duck manure are used for composting. In absence 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.

3.5 Additionality

As per paragraph 18 of applied methodology AMS-III.F "Avoidance of methane emissions through composting" (Version 12.0), project participant 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>. Thus, the additionality analysis for the proposed project should applied the Tool 21: "Demonstration of additionality of small-scale project activities" (Version 13.1).

In the following, additionality of the project is described as per Tool 21: "Demonstration of additionality of small-scale project activities" (Version 13.1). According to paragraph 10 of the Tool 21, project participant 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 chooses "Option a): investment barrier" to demonstrate the additionality of the project, which is discussed below:

The project activity has revenue by sales of composting products. Thus, a simple cost analysis is not indicated, but a benchmark analysis should be carried out. And the project proponent applies Benchmark Analysis to conduct Investment Analysis due to the financial status of the project in the composting industry. The following benchmark analysis, based on the IRR of the project cash flows, can evaluate the financial situation of the proposed project activity in the absence of carbon credits revenue.

The production and sale of Organic fertilizer belongs to the "Fertilizer Industry" as per Industrial classification for national economic activities (GB/T 4754—2017). Therefore, according to the "Financial benchmark rate of return for construction projects", the benchmark of equity IRR post-tax of "Fertilizer Industry" is 10%.

1) Basic parameters

Table 3.4 Basic Parameter of IRR Calculation

Parameter	Value	Source
Annual organic fertilizer production	30,000 tonnes/year	FSR
Price of organic fertilizer	300 CNY/tonne	FSR
Static investment	50,000,000 CNY	FSR
Annual O&M cost	3,004,037 CNY/year	FSR
Operation Period	15 years	FSR
Construction Period	1 years	FSR
Rate of residual value	5.00%	FSR
VAT tax rate for organic fertilizers sales	9%	FSR
Tax refund for organic fertilizer sales[6]	100%	FSR
VAT of materials purchasing	9%	FSR
Urban maintenance and construction tax	5%	FSR
Surtax for education	5%	FSR
Income tax	25%	FSR

[6] http://szs.mof.gov.cn/zt/xczx/202012/t20201216_3635126.htm

Emission reductions	59,284 tCO_2e/year	Calculated
Price of VCUs	25 CNY/tCO_2e	Expected

2) Comparison of the project IRR with the benchmark of equity IRR post-tax of "Fertilizer Industry".

Without income from selling VCUs, the IRR of the proposed project is 6.99%, 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 10.41%, higher than the benchmark, and the proposed project is financially acceptable.

Table 3.5 Comparison of IRR with and without income from VERs

Item	Without income from VERs	Benchmark	With income from VERs
The Project IRR	6.99%	10%	10.41%

3) Sensitivity analysis

The sensitivity analysis is conducted to check whether, under reasonable deviations in four major financial parameters, the project would remain financially unattractive, i.e. the project's IRR without the VER revenue would remain below the equity IRR post-tax. The four major financial parameters that significantly affect the project's IRR are:

- Static investment
- Annual organic fertilizer production
- Annual O&M cost
- Price of organic fertilizer

The impacts of the above parameters on the project's IRR were analyzed. The results of the sensitivity analysis of the four indicators are shown in Table 3.6.

Table 3.6 Sensitivity analysis of the project's IRR to different financial parameters

Hypothetic change	**–10%**	**-5%**	**0**	**+5%**	**+10%**
Static investment	8.64%	7.78%	6.99%	6.27%	5.60%
Annual organic fertilizer production	4.83%	5.93%	6.99%	8.04%	9.07%
Annual O&M cost	7.70%	7.35%	6.99%	6.64%	6.28%
Price of organic	4.83%	5.93%	6.99%	8.04%	9.07%

fertilizer					

It can be seen from the above analysis, when the static investment, annual organic fertilizer production, annual O&M cost and price of organic fertilizer are changing within the range of -10% to 10%, the project IRR of the project is always lower than benchmark IRR and lacking financial attractiveness.

In all, when the key parameters fluctuate within a reasonable range, the project will never be economically attractive.

4) Conclusion

To summarize, "the project is undertaken without being registered as a VCS project activity" is not financially attractive to investors, thus 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 the paragraph 23 of AMS-III.F "Avoidance of methane emissions through composting" (Version 12.0), 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 (ver. 21.0) may be used.

As per paragraph 24 of AMS-III.F "Avoidance of methane emissions through composting" (Version 12.0), baseline emissions are:

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

Where:

BE_y = Baseline emissions in the year y (tCO_2e)

$BE_{CH4,SWDS,y}$ = 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 "Emissions from solid waste disposal sites" (tCO_2e). The tool may be used with the factor "f =0.1" taking into account the methane oxidation effect by the upper layer of the landfill. With the definition of year x as 'the year since the project activity started diverting wastes from landfill disposal, x runs from the first year of crediting period (x =1) to the year for which emissions are calculated ($x = y$)' (tCO_2e)

$BE_{ww,y}$ = Where applicable, baseline emissions from the wastewater co-composted, calculated as per the procedures in AMS-III.H (tCO_2e)

$BE_{CH4,manure,y}$ = Where applicable, baseline emissions from manure composted by the project activities, as per the procedures in AMS-III.D (tCO_2e)

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

GWP_{CH4} = Global Warming Potential for CH_4 applicable to the crediting period (t CO_2e/tCH_4)

1) Methane generation potential of the solid waste composted ($BE_{CH4,SWDS,y}$)

   For the project, only the swine, chicken, and duck manure from livestock farms in Hengyang are used for composting to produce the organic fertilizer, and no solid waste is used. So, the $BE_{CH4,SWDS,y}$ is irrelative to the project.

2) Baseline emissions from the wastewater co-composted ($BE_{ww,y}$)

   Since there is no co-composting in the project, therefore $BE_{ww,y}$ is irrelative to the project.

3) Baseline emissions from manure composted ($BE_{CH4,manure,y}$)

   Base above description, Baseline emissions from manure composted is calculated by using paragraph 17(b) of AMS-III.D (Version 21.0):

   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.

As per paragraph 17(b) and 19 of AMS-III.D (Version 21.0), the baseline emissions from manure composted is calculated following the:

$$BE_{CH4,manure,y} = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y} \quad (2)$$

Where:

$BE_{CH4,manure,y}$ = Baseline emissions from manure composted in year y (tCO_2e)

GWP_{CH4} = Global Warming Potential (GWP) of CH_4 applicable to the crediting period (tCO_2e/tCH_4)

D_{CH4} = CH_4 density (0.00067 t/m^3 at room temperature (20 °C) and 1 atm pressure)

UF_b = Model correction factor to account for model uncertainties (0.94)

j = Index for animal manure management system

LT = Index for all types of livestock

$Q_{manure,j,LT,y}$ = Quantity of manure treated from livestock type LT and animal manure management system j (tonnes/year, dry basis)

$SVS_{j,LT,y}$ = Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis)

MCF_j = Annual methane conversion factor (MCF) for the baseline animal manure management system j

$B_{0,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg-dm)

Determine the various variables and parameters for equation (2):

a) Maximum methane producing potential of the manure (B_0)

As per the paragraph 18 (a) of AMS-III.D (Version 21.0), The maximum methane-producing capacity of the manure (B_0) varies by species and diet. The preferred method to obtain B_0 measurement values is to use data from country-specific published sources, measured with a standardised method (B_0 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 values are not available, default values from tables 10.16 of 2019 Refinement to the 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;

As per table 10.16 (Updated) of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10, the maximum methane producing potential (B_0) for swine and chicken are 0.45, 0.36 m^3CH_4/kg-dm, and the maximum methane producing potential (B_0) for duck is consistent with 2006 IPCC because the duck farm is not Pasture/Range/Paddock (PRP).

The project chooses the default value from tables 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10. The maximum methane producing potential (B_0) for duck in developing county is 0.24 m^3CH_4/kg-dm.

b) Methane Conversion Factors (MCF)

As per the paragraph 18 (f) of AMS-III.D (Version 21.0), Methane Conversion Factors (MCF) values are determined for a specific manure management system and represent the degree to which B_0 is achieved. Where available country-specific MCF values that reflect the specific management systems used in particular countries or regions shall be used. Alternatively, the IPCC default values provided in table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 can be used. 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 the MCF, the project applies the IPCC default values provided in table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10. The climate zone of Hengyang County belongs to Warm Temperate Moist[7], so the MCF of the project should apple the 73%.

c) Quantity of manure ($Q_{manure,j,LT,y}$)

In the Ex-ante calculation, $Q_{manure,j,LT,y}$ was calculated using the amounts and moisture content of swine, chicken, and duck manure in the feasibility study report. The measured values will be used in subsequent monitoring, as detailed in Section 5.2.

d) Specific volatile solids content of animal manure ($SVS_{j,LT,y}$)

In the Ex-ante calculation, the specific volatile solids content of animal manures for swine, chicken, and duck manure used the values from the feasibility study report. The measured values will be used in subsequent monitoring, as detailed in Section 5.2.

4) $MD_{y,reg}$

[7] http://www.hyx.gov.cn/zjzy/zrdl/20200214/i1017913.html

No regulation requirements specify the amount of methane that should be captured or combusted for livestock farms in China. And therefore $MD_{y,reg}$= 0.

Please refer to Section 4.4 about the ex-ante Calculation.

4.2 Project Emissions

As per the paragraph 26 of AMS-III.F (Version 12.0), project emissions from composting process (PE_y) shall be determined as per the latest version of the methodological 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 the paragraph 13 of Tool 13 (Version 02.0), the project emissions from composting are estimated as follows:

$$PE_y = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{N2O,y} + PE_{RO,y} \quad (3)$$

Where:

PE_y = Project emissions in the year y (tCO_2e)

$PE_{EC,y}$ = Project emissions from electricity consumption associated with composting in year y (tCO_2/yr)

$PE_{FC,y}$ = Project emissions from fossil fuel consumption associated with composting in year y (tCO_2/yr)

$PE_{CH4,y}$ = Project emissions of methane from the composting process in year y (tCO_2e/yr)

$PE_{N2O,y}$ = Project emissions of nitrous oxide from the composting process in year y (tCO_2e/yr)

$PE_{RO,y}$ = Project emissions of methane from run-off wastewater associated with co-composting in year y (tCO_2e/yr)

1) Determination of the quantity of waste composted (Q_y)

As per paragraph 14 of Tool 13: "Project and leakage emissions from composting" (Version 02.0), The quantity of waste composted is a parameter required in the determination of emissions associated with each source of project emissions. There are two options to determine the quantity of waste composted in year y (Q_y). In case of co-composting, wastewater is not accounted for in the estimation of Q_y.

Option 1: Procedure using a weighing device

Monitor the weight of waste delivered to the composting installation using an on-site weighbridge or any other applicable and calibrated weighing device (e.g. belt-scales).

Option 2: Procedure without using a weighing device

This procedure shall only be applied in the case that there is no weighbridge or any other applicable and calibrated weighing device available on site. Under this procedure, Q_y is calculated based on the carrying capacity of each truck delivering waste to the composting installation in year y ($CT_{t,y}$), as follows:

$$Q_y = \sum_t CT_{t,y} \quad (4)$$

Where:

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

$CT_{t,y}$ = Carrying capacity of truck t used in year y to deliver waste to the composting installation (t)

t = Waste deliveries in trucks to the composting installation in year y

The project chooses **Option 1** to calculate the Quantity of waste composted. The project uses an on-site weighbridge to monitor the weight of manure transported to the composting facility.

2) Determination of project emissions from electricity consumption ($PE_{EC,y}$)

As per paragraph 18 of Tool "Project and leakage emissions from composting" (Version 02.0), when applying this tool, if monitored data for electricity consumption is not available, then electricity consumption from composting ($EC_{PJ,comp,y}$) may be determined based on a default value for the specific quantity of electricity consumed per tonne of waste composted ($SEC_{comp,default}$), according to equation (7). Note that the methodological tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" also provides options to calculate emission based on nonmonitored parameters, including a default emission factor for the emissions per MWh of electricity consumed and an option to estimate electricity consumption based on the rated capacity of the captive power plant (if applicable).

$$EC_{PJ,comp,y} = Q_y \times SEC_{comp,default} \quad (5)$$

Where:

$EC_{PJ,comp,y}$ = Quantity of electricity consumed for composting in year y (MWh/yr)

$SEC_{comp,default}$ = Default value for the specific quantity of electricity consumed per tonne of waste composted (MWh/t)

As per the Tool 05: "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0), the project emissions from electricity consumption should be calculated as follows:

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y}) \quad (6)$$

Where:

$PE_{EC,y}$ = Project emissions from electricity consumption in year y (tCO_2/yr).

$EC_{PJ,j,y}$ = Quantity of electricity consumed by the project electricity consumption source j in year y (MWh/yr), which is equative to $EC_{PJ,comp,y}$ in Equation (5).

$EF_{EF,j,y}$ = 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. The electricity consumed by facilities of the composting system is sourced from local power grid connected to Central China Power Grid (CCPG). Scenario A: Electricity consumption from the grid is applied to the project. For project electricity consumption sources, a default value of 20% is used for $TDL_{j,y}$.

Determination of the emission factor for electricity generation ($EF_{EF,j,y}$)

The determination of the emission factor for generation is performed as per Option A2: Use the following conservative default values:

a) A value of 1.3 t CO_2/MWh if:

i. Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources; or

ii. Scenario A applies to: both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the project and leakage sources is greater than the electricity consumption of the baseline sources;

b) A value of 0.4 t CO_2/MWh for electricity grids where hydro power plants constitute less than 50% of total grid generation in 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production, and a value of 0.25 t CO_2/MWh for other electricity grids. These values can be used if:

i. Scenario A applies only to baseline electricity consumption sources but not to project or leakage electricity consumption sources; or

ii. Scenario A applies to both baseline and project (and/or leakage) electricity consumption sources; and the electricity consumption of the baseline sources is greater than the electricity consumption of the project and leakage sources.

$EF_{EF,j,y}$ value is taken as 1.3 t CO_2/MWh, as it is used to the project electricity consumption sources.

3) Determination of project emissions from fossil fuel consumption ($PE_{FC,y}$)

As per paragraph 19 of Tool 13: "Project and leakage emissions from composting" (Version 02.0), 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:

$$PE_{FC,y} = Q_y \times EF_{FC,default} \quad (8)$$

Where:

$EF_{FC,default}$ = Default emission factor for fossil fuels consumed by the composting activity per tonne of waste (tCO_2/t)

The project chooses the **Option 2** to calculate the the project emissions from fossil fuel consumption. As per the "Data / Parameter table 5" of Tool "Project and leakage emissions from composting" (Version 02.0), the $EF_{FC,default}$ is 0.0207 tCO_2/t.

4) Determination of project emissions of methane ($PE_{CH4,y}$)

As per paragraph 22 of Tool "Project and leakage emissions from composting" (Version 02.0), project emissions of methane from composting ($PE_{CH4,y}$) are determined as follows:

$$PE_{CH4,y} = Q_y \times EF_{CH4,y} \times GWP_{CH4} \quad (9)$$

Where:

$EF_{CH4,y}$ = Emission factor of methane per tonne of waste composted valid for year y (tCH_4/t)

To determine the Emission factor of methane ($EF_{CH4,y}$), there are two options which project participants may choose:

Option 1: Procedure using monitored data

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

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

The project chooses the "**Option 2: Procedure using default values"** and apply the default value of Emission factor of methane ($EF_{CH4,y}$). As per the "Data / Parameter table 2" of Tool "Project and leakage emissions from composting" (Version 02.0), the $EF_{CH4,default}$ is 0.002 tCH_4/t.

5) Determination of project emissions of nitrous oxide ($PE_{N20,y}$)

As per paragraph 26 of Tool "Project and leakage emissions from composting" (Version 02.0), project emissions of nitrous oxide from composting ($PE_{N20,y}$) are determined as follows:

$$PE_{N20,y} = Q_y \times EF_{N20,y} \times GWP_{N20} \quad (10)$$

Where:

$EF_{N20,y}$ = Emission factor of nitrous oxide per tonne of waste composted valid for year y (t CH_4/t)

GWP_{N20} = Global Warming Potential of N_2O (tCO_2e/tN_2O)

To determine the Emission factor of nitrous oxide ($EF_{N20,y}$), there are two options which project participants may choose:

Option 1: Procedure using monitored data

$EF_{N20,y}$ is determined based on measurements of the nitrous oxide emissions during a composting cycle ($ECC_{N20,c}$)

Option 2: Procedure using default values

A default value is used: $EF_{N20,y}$=$EF_{N20,default}$. The default value is provided in the "Data and parameters not monitored" section of Tool 13: "Project and leakage emissions from composting" (Version 02.0).

The project chooses the "**Option 2: Procedure using default values"** and apply the default value of Emission factor of nitrous oxide ($EF_{N20,y}$). As per the "Data / Parameter table 3" of Tool "Project and leakage emissions from composting" (Version 02.0), the $EF_{N20,default}$ is 0.0002 tN_2O/t.

6) Determination of project emissions from run-off wastewater ($PE_{RO,y}$)

As per paragraph 26 of Tool "Project and leakage emissions from composting" (Version 02.0), project emissions of methane from run-off wastewater ($PE_{RO,y}$) are calculated only for the case of co-composting.

The project does not involve co-composting, therefore $PE_{RO,y}$ is irrelevant to the project.

Please refer to Section 4.4 about the ex-ante Calculation.

4.3 Leakage

As per the paragraph 27 of AMS-III.F (Version 12.0), 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 (LE_y).

The project does not involve the equipment transferred from another activity. And all equipment is new-purchased. Thus, the project does not involve the existing equipment being transferred to another activity.

As per the paragraph 28 of AMS-III.F (Version 12.0), 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. The relevant procedures in the leakage part of the methodological tool "Project and leakage emissions from composting" shall be followed.

For the project, the compost is stored in an aerobic condition, not an anaerobic condition. And the project does not involve disposing of compost in an SWDS.

Therefore, there are no leakage emissions associated with the project activity.

4.4 Net GHG Emission Reductions and Removals

In the case of construction of new 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. Thus, the emission reduction is calculated as follows:

$$ER_y = BE_y - (PE_y + LE_y) \quad (11)$$

Where:

ER_y = Emission reduction in the year y (tCO_2e)

LE_y = Leakage emissions in year y (tCO_2e)

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

1) **Ex-ante calculation of Baseline Emissions**

a) Baseline emissions from duck manure composting ($BE_{CH4,manure,y}$)

As per Equation (2), the $BE_{CH4,manure,y}$ is ex-ante calculated as follows:

Table 4.3 Ex-ante Calculation of Baseline emissions from manure composting

Parameter	Value		Unit	Source
GWP_{CH4}	27.9		tCO_2/tCH_4	From IPCC Sixth Assessment Report (AR6).
D_{CH4}	0.00067		t/m^3	"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	73%		-	Table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10
$B_{0,LT}$	swine	0.45	m^3 CH_4/kg-dm	Table 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10, and Table 10.16 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10
	chicken	0.36		
	duck	0.24		
$SVS_{LT,y}$	swine	60.00%	kg-dm/animal/year	FSR
	chicken	65.00%		
	duck	65.00%		
$Q_{manure,j,LT,y}$	swine	16,000	tonnes	FSR

	chicken	3,200		
	duck	800		
$BE_{CH4,manure,y}$	66,619		tCO_2e	Calculation

b) As per Equation (1), the BE_y is ex-ante calculated as follows:

Table 4.4 Ex-ante Calculation of Baseline emissions

Parameter	Value	Unit	Source
$BE_{CH4,SWDS,y}$	-	tCO_2e	Irrelevant
$BE_{ww,y}$	-	tCO_2e	Irrelevant
$BE_{CH4,manure,y}$	66,619	tCO_2e	Calculation
$MD_{y,reg}$	0	tonne	-
GWP_{CH4}	27.9	tCO_2/tCH_4	From IPCC Sixth Assessment Report (AR6).
BE_y	66,619	tCO_2e	Calculation

2) Ex-ante calculation of Project Emissions

a) Ex-ante identify the quantity of manure composted (Q_y)

The ex-ante quantity of manure composted is based on the estimated quantity from the Feasibility Study Report (FSR), which is 50,000 tonnes per year.

The ex-post quantity of manure composted shall be calculated as per Equation (4). The carrying capacity is from the nameplate of the payload truck, and the workers will record the carrying capacity of each truck delivering manure.

b) As per Equation (5) and (6), project emissions from electricity consumption ($PE_{EC,y}$) is calculated as follows:

Table 4.5 Ex-ante Calculation of project emissions from electricity consumption

Parameter	Value	Unit	Source
Q_y	50,000	tonnes	FSR
$SEC_{comp,default}$	0.01	MWh/t	Tool 13 "Project and leakage

			emissions from composting" (Version 02.0)
$EF_{EF,j,y}$	1.3	tCO_2e/MWh	Tool 05:" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)
$TDL_{j,y}$	0.2	-	Tool 05:" Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)
$PE_{EC,y}$	780	tCO_2e	Calculate

c) As per Equation (8), project emissions from fossil fuel consumption ($PE_{FC,y}$) is calculated as follows:

Table 4.6 Ex-ante Calculation of project emissions from fossil fuel consumption

Parameter	Value	Unit	Source
Q_y	50,000	tonnes	FSR
$EF_{FC,default}$	0.0207	tCO_2/t	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
$PE_{FC,y}$	1,035	tCO_2e	Calculate

d) As per Equation (9), project emissions of methane ($PE_{CH4,y}$) is calculated as follows:

Table 4.7 Ex-ante Calculation of project emissions of methane

Parameter	Value	Unit	Source
Q_y	50,000	tonnes	FSR
$EF_{CH4,y}$	0.002	tCH_4/t	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
GWP_{CH4}	27.9	tCO_2/tCH_4	From IPCC Sixth Assessment Report

			(AR6).
$PE_{CH4,y}$	2,790	tCO_2e	Calculate

c) As per Equation (10), project emissions of nitrous oxide ($PE_{N20,y}$) is calculated as follows:

Table 4.8 Ex-ante Calculation of project emissions of nitrous oxide

Parameter	Value	Unit	Source
Q_y	50,000	tonnes	FSR
$EF_{N20,y}$	0.0002	tCH_4/t	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
GWP_{N20}	273	tCO_2/tN_2O	From the IPCC Sixth assessment report (AR6)
$PE_{N20,y}$	2,730	tCO_2e	Calculate

d) As per Equation (3), project emissions (PE_y) is calculated as follows:

Table 4.9 Ex-ante Calculation of project emissions

Parameter	Value	Unit	Source
$PE_{EC,y}$	780	tCO_2e	Calculate
$PE_{FC,y}$	1,035	tCO_2e	Calculate
$PE_{CH4,y}$	2,790	tCO_2e	Calculate
$PE_{N20,y}$	2,730	tCO_2e	Calculate
$PE_{RO,y}$	–	tCO_2e	Irrelevant
PE_y	7,335	tCO_2e	Calculate

3) Ex-ante calculation of Leakage

As per section 4.3, there are no leakage emissions associated with the project activity.

4) Ex-ante calculation of Emission reductions

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)
03-Jan-2022	-	31-Dec-2022	66,254	7,295	0	58,959
01-Jan-2023	-	31-Dec-2023	66,619	7,335	0	59,284
01-Jan-2024	-	31-Dec-2024	66,619	7,335	0	59,284
01-Jan-2025	-	31-Dec-2025	66,619	7,335	0	59,284
01-Jan-2026	-	31-Dec-2026	66,619	7,335	0	59,284
01-Jan-2027	-	31-Dec-2027	66,619	7,335	0	59,284
01-Jan-2028	-	31-Dec-2028	66,619	7,335	0	59,284
01-Jan-2029	-	02-Jan-2029	365	40	0	325
Total			66,619	7,335	0	59,284

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	GWP_{CH4}
Data unit	tCO_2e/tCH_4
Description	Global Warming Potential (GWP) of CH_4 applicable to the project
Source of data	the IPCC Sixth Assessment Report
Value applied	27.9
Justification of choice of data or description of measurement methods and procedures applied	Default value of 27.9 from IPCC Sixth Assessment Report (AR6). Shall be updated according to any future revision to VCS standard by VERRA.
Purpose of Data	Calculation of baseline emissions and project emissions

Comments	-

Data / Parameter	D_{CH4}
Data unit	t/m^3
Description	CH_4 density
Source of data	AMS-III.D (Version 21.0)
Value applied	0.00067 (at 20 °C and 1 atm pressure)
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of baseline emissions and project emissions
Comments	-

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	-
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	MCF_j
Data unit	-
Description	Annual methane conversion factor (MCF) for the baseline animal

	manure management system j
Source of data	Table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10
Value applied	73%
Justification of choice of data or description of measurement methods and procedures applied	No country or regional specific value is available. Default value from table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10 is applied. The climate zone of Yongtai County belongs to Warm Temperate Moist[8], the corresponding annual methane conversion factor (MCF) is 73%.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type LT
Source of data	Table 10 A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10 and table 10.17 of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10
Value applied	Animal: Value swine: 0.45 chicken: 0.36 duck: 0.24
Justification of choice of data or description of measurement methods and procedures applied	No country or regional specific value is 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 are applied. As per the paragraph 17 (d) of AMS-III.D (Version 21.0), the project meets the four requirements for the application of the

[8] http://www.hyx.gov.cn/zjzy/zrdl/20200214/i1017913.html

	developed countries' B_0 or VS values from IPCC 2006, which has been described in Section 4.1. As per Table 10.16 (Updated) of 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories volume 4 Chapter 10, the maximum methane producing potential (B_0) for duck is consistent with 2006 IPCC because the duck farm is not Pasture/Range/Paddock (PRP). For swine, chicken, and ducks, the developed countries' B_0 values are 0.45, 0.36, 0.24 m^3 CH_4/kg dm, which are applied in the project.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$SEC_{comp,default}$
Data unit	MWh/t
Description	Default value for the specific quantity of electricity consumed per tonne of waste composted
Source of data	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
Value applied	0.01
Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{EF,j,y}$
Data unit	tCO_2e/ MWh
Description	Combined margin emission factor for the grid in year y
Source of data	Tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0)

Value applied	1.30
Justification of choice of data or description of measurement methods and procedures applied	According to the tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0), a) Use as default values of 1.3 tCO_2e/ MWh for: (i) Scenario A applies only to project and/or leakage electricity consumption sources but not to baseline electricity consumption sources;
Purpose of Data	Calculation of project emissions
Comments	-

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" (Version 03.0)
Value applied	20%
Justification of choice of data or description of measurement methods and procedures applied	According to the tool 05 "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (Version 03.0), i) Use as default values of 20% for: (a) project or leakage electricity consumption sources;
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{FC,default}$
Data unit	tCO_2/t
Description	Default emission factor for fossil fuel consumed by the composting activity per tonne of waste composted (wet basis)
Source of data	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
Value applied	0.0207

Justification of choice of data or description of measurement methods and procedures applied	-
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{CH4,y}$=$EF_{CH4,\text{default}}$
Data unit	tCH_4/t
Description	Default emission factor of methane per tonne of waste composted (wet basis)
Source of data	Tool 13 "Project and leakage emissions from composting" (Version 02.0)
Value applied	0.002
Justification of choice of data or description of measurement methods and procedures applied	As per Tool 13 "Project and leakage emissions from composting" (Version 02.0), the project chooses the "Option 2: Procedure using default values" and apply the default value of Emission factor of methane ($EF_{CH4,y}$). As per the "Data / Parameter table 2" of Tool "Project and leakage emissions from composting" (Version 02.0), the $EF_{CH4,\text{default}}$ is 0.002 tCH_4/t.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	$EF_{N2O,y}$=$EF_{N2O,\text{default}}$
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	As per Tool 13 "Project and leakage emissions from composting" (Version 02.0), the project chooses the "Option 2: Procedure using default values", and apply the default value of Emission

and procedures applied	factor of nitrous oxide ($EF_{N2O,y}$). As per the "Data / Parameter table 3" of Tool "Project and leakage emissions from composting" (Version 02.0), the $EF_{N2O,\text{default}}$ is 0.0002 tN_2O/t.
Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	GWP_{N2O}
Data unit	tCO_2/tN_2O
Description	Global Warming Potential (GWP) of N_2O applicable to the project
Source of data	the IPCC Sixth Assessment Report
Value applied	273
Justification of choice of data or description of measurement methods and procedures applied	Default value of 273 from IPCC Sixth Assessment Report (AR6). Shall be updated according to any future revision to VCS standard by VERRA.
Purpose of Data	Calculation of project emissions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$SVS_{j,LT,y}$
Data unit	tonnes VS/tonnes--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	As per AMS-III.D. (Version 21.0), If animal manure is treated in a centralized plant, as the case in paragraph 17(b), testing shall be performed according to the guideline in annex 2 of AM0073. The specific testing and calculation methods are as follows: Name: Method for determination of Volatile Solids in animal

	waste. From: USDA. Agricultural Waste Management Field Handbook. Chapter 4 – Agricultural Waste Characteristics. Page 2. **Definitions** • Total Solids: Residue remaining after water is removed from waste material by evaporation; dry matter; • Volatile Solids: The part of total solids driven off as volatile (combustible) gases when heated to 600° C; organic matter; • Fixed Solids: The part of total solids remaining after volatile gases driven off at 600° C; ashes. **Determination method** 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 600° C 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 $W1$ is the weight of sample container, $W2$ is combined weight of the sample container and oven dried sample, Wf is the combined constant weight of the sample container and sample after heating at 600° C
Frequency of monitoring/recording	Annually
Value applied	The following values from FSR are used for ex-ante estimation. Animal / Value swine / 60.00% chicken / 65.00% duck / 65.00% During the monitoring period, the actual value will be calculated based on the records monitored by staff.
Monitoring equipment	Muffle furnace, electronic balance
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 project emissions
Calculation method	-
Comments	-

Data / Parameter	$Q_{manure,LT,y}$
Data unit	tonnes—dm/year
Description	Quantity of manure treated from livestock type LT at animal manure management system j
Source of data	Onsite measurements 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	As per AMS-III.D. (Version 21.0), As the case in paragraph 17(b), manure weight shall be directly measured. The quantity and the moisture content of animal manure from different farms and different animal types shall be measured separately by the on-site weighbridge and baking oven ,and recorded separately for crosscheck.
Frequency of monitoring/recording	Annually, based on daily measurement and monthly aggregation
Value applied	The following values from FSR are used for ex-ante estimation. Animal: Value swine: 16,000 chicken: 3,200 duck: 800 During the monitoring period, the actual value will be calculated based on the quantity and the moisture content of animal manure recorded by the staff for different farms and different animal types.
Monitoring equipment	Baking oven, weighbridge
QA/QC procedures to be applied	The Periodic calibration of weighbridge should be conducted by an independent recognized testing agency, and which is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications. The baking oven do not require calibration.

Purpose of data	Calculation of project emissions
Calculation method	Quantity of manure (dry basis) = Quantity of manure (wet basis) × (1 - moisture content of manure (wet basis))
Comments	-

Data / Parameter	Q_y
Data unit	t/yr
Description	Quantity of waste composted in year y (wet basis)
Source of data	The record of the Hengyang Peike Animal Manure Composting Project
Description of measurement methods and procedures to be applied	As per paragraph 16 of Tool 13 "Project and leakage emissions from composting" (Version 02.0), Q_y could be measured by an on-site weighbridge.
Frequency of monitoring/recording	Continuously
Value applied	50,000 tonnes/year from FSR is used for ex-ante estimation.
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of project emissions
Calculation method	-
Comments	-

5.3 Monitoring Plan

The monitoring plan presented in this PD 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 period. The details of the monitoring plan are specified as follows:

A. Data and parameters

Data and parameters to be monitored are listed below shows the corresponding parameters monitored included as following:

Parameter	Description	Monitoring and Recording
$SVS_{j,LT,y}$	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y	The staff will measure and record the Specific volatile solids content of animal manure in Hengyang Peike Animal Manure Composting Project. Data will be validated by experts and workers at the project site.
Q_y	Quantity of manure composted in year y (wet basis)	The staff will monitor and record the quantity of manure measured by the on-site weighbridge. Data will be validated by experts and workers at the project site.
$Q_{manure,LT,y}$	Quantity of manure treated from livestock type LT at animal manure management system j	The staff will monitor and record the quantity and moisture content of swine, chicken, and duck manure. Data will be validated by experts and workers at the project site.

B. Management Structure

The project owner organizes a specific VCS team in the project development department to be responsible for data collection, supervision, and witness to the whole process of data monitoring and recording. A VCS manager is appointed to take full responsibility for the overall monitoring of the project. The monitoring and recording of $SVS_{j,LT,y}$, quantity and moisture content of manure composted etc. are carried out by a few designated monitoring officers. In addition, the project developer appoints internal verifiers who is responsible for internal check of the measurement, collection of relevant record, and the calculation of the emission reductions. A monitoring and management manual of the project that identifies detailed duties and responsibilities of the relevant parties is developed and served as the basis of the project monitoring. Figure 5.1 shows the operation and management structure of the project.

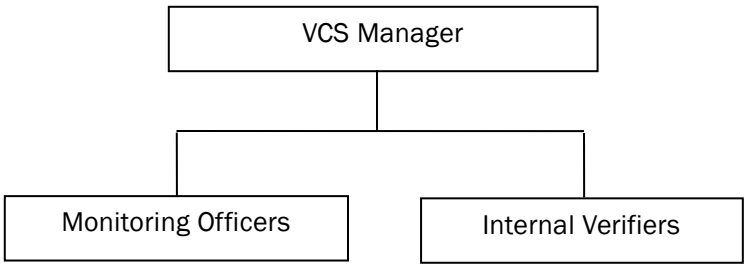


Figure 5.1: Operation and management structure of the project

C. Data collection

Monitoring officers are responsible for data collection. Designated teams will monitor, collect and record the monitored data regularly. The relevant production and operation data records will serve as the main data source for emission reduction calculation. All record files will be collected by a designated monitoring officer, who will prepare backup in time and archive all documents properly.

D. QA&QC

Before implementing the project, the project owner trains 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 each animal manure in the three-parallel sample, compared with the publicly available data.

E. Data file management

All monitoring data will be filed regularly, and the data files will be archived in printed hard copy or electronic disk copy. Other documents in paper e.g., maps, forms, and environment assessment reports will be preserved as well. All data collected as part of monitoring will be archived electronically and be kept at least 2 years after the end of the crediting period. The project owner will provide original records and documents if necessary.

APPENDIX 1: <EVIDENCE OF SDG 8>

Evidence for SDG 8: The payroll with more detailed has been submitted as a separate document to VVB due to confidentiality requirement of the project proponent.