GANSU HUI COUNTY MUGE SWINE FARM MANURE MANAGEMENT SYSTEM GHG MITIGATION PROJECT

Document Prepared by CTI Certification Co., Ltd

(CTI)

Project Title	Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project
Report Title	Validation & Verification Report of Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project
Version	1.1
Report ID	CTI/NB-2022-12002
Verification Period	01-June-2021 to 31-January-2023
Client	Baineng New Energy (Shenzhen) Co.,Ltd.

Pages	159
Date of Issue	16-October-2023
Prepared By	CTI Certification Co., Ltd (CTI)
Contact	Address: F8-A CTI Building, No.4 LiuXianSan Road, Xin'an Street, Bao'an District, 518101, Shen Zhen, China Tel: +86 10 65580012 Email: linshunrong@cti-cert.com Website: http://www.cti-cert.org
Approved By	Zhou Lu
Work Carried Out By	Team Leader: Zhang Lei Team Member: Zhang Wenting Technical Reviewer: Lin Shunrong

Summary:

- A description of the project

The project activity developed in Wangzhuang Village, Chengguan Town, Hui County, Longnan City, Gansu Province, China, is to install a new animal waste management systems (AWMS) by replace the current open anaerobic lagoons with new closed anaerobic digesters in project area, which will treat the manure and wastewater from the existing swine farm to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. The project activity involves implemented one set of AWMS in the existing swine farm involving 41,935 heads of market swine 5,885 heads of breeding swine, it is estimated to produce 29,674.5 tons of manure and $482.59*10^4 m^3$ of biogas annually. The biogas produced is recovered and combusted for heat generation and used by swine farms. The project started operation on 01/06/2021 with the VCS Ref. No. 3950. The project is expected to achieve 42,657 tCO_2e of emission reduction annually and total emission reductions 298,604 tCO_2e in the first crediting period 01/06/2021 - 31/05/2028.

- A description of the validation and verification

CTI Certification Co., Ltd (hereafter referred to as CTI) has been commissioned by Baineng New Energy (Shenzhen) Co.,Ltd. to perform the joint validation and verification of “Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project” (Ref. No. 3950)

(hereafter referred to as the project) in China and reported in the joint Validation&Verification Report.

The validation and verification includes confirming the project's design description, baseline, additionality, monitoring plan to be compliance with relevant VCS and host party criteria, and implementation of the monitoring plan in the Joint Project Description& Monitoring Report (hereafter referred to as "Joint-PD-MR") to the application of the CDM methodology ACM0010 Version 08: "GHG emission reductions from manure management systems".

- The purpose and scope of validation and verification

The validation objective is an independent assessment by a Third Party of a proposed project against all defined criteria set for the registration under the VCS. In order to confirm that the project activity, as documented, is sound reasonable and meets the identified criteria, the validation involves the assessment of: project conformance to VCS standards/programs, project conformance to the applied methodology, including the procedure for the demonstration of additionality specified in the methodology; and likelihood that methods and procedures set out in the project description will generate verifiable GHG data and information when implemented. Validation is a requirement and is seen as necessary to provide assurance to stakeholders of the quality of project and its intended generation of VCUs. Validation is part of the VCS project cycle and will finally result in a conclusion by the executing VVB whether a project activity is valid to be submitted for registration to VCS registry.

The objective of the verification is to have an independent review ex post determination by a VVB (Validation and Verification Body) of the monitored GHG emission reductions that have occurred as a result of the implementation of the project activity during a defined monitoring period.

- The method and criteria used for validation and verification

Validation and Verification is conducted using CTI procedures in line with the requirements specified in the latest version of the VCS Validation and Verification Manual (Version 3.2) and applying auditing techniques. The validation/verification team assessed the project's compliance against the VCS Standard Version 4.4, the selected CDM methodology and the joint project description and monitoring report. The project is eligible under Project Scope 1, 13 and 15. The validation/verification criteria followed the guidance documents provided by VCS included the following: VCS Standard Version 4.4, VCS Program Guide Version 4.3, Program Definitions Version 4.3, Registration & Issuance Process Version 4.3 and the applied CDM methodology ACM0010 "GHG emission reductions through multi-site manure collection and treatment in a central plant", Version 08 and referenced tools.

- The number of findings raised during validation and verification

In the course of the validation and verification, 8 Clarification Requests (CLs) and 10 Corrective

Action Requests (CARs) were raised and successfully closed. No Forwarded Action Requests (FARs) was raised.

- Any uncertainties associated with the validation and verification

There are no restrictions of uncertainty for both validation and verification.

- Summary of the validation and verification conclusions

Baineng New Energy (Shenzhen) Co.,Ltd. has commissioned the CTI to carry out the Verified Carbon Standard (VCS) validation joint with 1st periodical verification of the project, “Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project” (VCS ID 3950) with regard to the relevant requirements of VCS Standard Version 4.4. CTI confirms all validation and verification activities including objectives, scope and criteria, level of assurance, project description, monitoring and monitoring report adhere to VCS Standard Version 4.4 and all associated updated as documented in this report, are complete.

CTI concludes that the project activity “Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project” in China, as described in the final version of Joint-PD-MR, meets all relevant requirements for VCS validation and verification activity and correctly applied the methodology ACM0010 Version 08. Hence CTI is able to certify that the GHG emission reductions from the project during the monitoring period from 01/06/2021 to 31/01/2023 were generated as 58,604 tCO_2e which can be claimed as VCUs.

CONTENTS

1 INTRODUCTION

1.1. Objective

CTI Certification Co., Ltd (hereafter referred to as CTI) has been commissioned by Baineng New Energy (Shenzhen) Co.,Ltd. to perform a joint validation and verification of "Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project" in Bangladesh (VCS Project ID: 3950) (hereafter referred to as "the project").

The objective of validation is an independent assessment by a Third Party of a proposed project activity against all defined criteria set for the registration under the VCS. In order to confirm that the project activity, as documented, is sound reasonable and meets the identified criteria, the validation involves the assessment of: project conformance to VCS standards/programs, project conformance to the applied methodology, including the procedure for the demonstration of additionality specified in the methodology; and likelihood that methods and procedures set out in the project description will generate verifiable GHG data and information when implemented. Validation is a requirement and is seen as necessary to provide assurance to stakeholders of the quality of project and its intended generation of VCUs. Validation is part of the VCS project cycle and will finally result in a conclusion by the executing VVB whether a project activity is valid to be submitted for registration to Verra registry.

The objective of verification is the periodic independent review and ex-post determination by an accredited Third Party of the monitored reductions in GHG emissions that have occurred as a result of the VCS project activity during a defined verification period. A verification statement is the written assurance that, during a specific period in time, a project activity achieved the emission reductions as verified. For the project activity, the verification was to verify and provide a verification statement of emission reductions reported for the period 01/06/2021 to 31/01/2023.

1.2. Scope and Criteria

The validation scope is defined as an independent and objective review of the joint Project Design and Monitoring Report (Joint-PD-MR) to validate that (a) the project design is actual, (b) the baseline scenario is correctly defined as per the applied methodology and relate tools, (c) the project is additional, (d) the monitoring plan can be implemented and is transparent and adequate and (e) all data and information used for ex-ante calculation of emission reductions is of projected and/or hypothetical nature. The Joint-PD-MR is reviewed against the criteria stated in VCS standard version 4.4 /64/ and the approved baseline and monitoring methodology ACM0010 (Version 08). The validation was based on VCS Standards Version 4.4 /64/ applying auditing techniques. The validation is not meant to provide any consulting towards the project participants.

However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

The scope of the verification is to verify that: (a) the actual monitoring system and procedures are in compliance with the monitoring systems and procedures described in the monitoring plan; (b) the GHG emission reductions data and express a conclusion with a reasonable level of assurance about whether he reported GHG emission reductions data are free from material misstatement; (c) the reported GHG emissions data is sufficiently supported by evidence. Verification shall ensure that the reported GHG emission reductions are complete and accurate in accordance with the applicable VCS criteria in order to be certified. Verification is conducted using CTI procedures in line with the requirements specified in the VCS Program and ISO14064-3 requirements and applying auditing techniques. The VVB assessed and determined that the implementation and operation of the project, and steps to report GHG emission reductions comply with the VCS rules. The verification involved a document review of relevant documentation and interview with the project participants. Verification is not meant to provide any consultancy towards the project participants; however, stated request for clarifications and/or corrective actions may have provided input for improvement of the monitoring.

1.3. Reasonableness of Assumptions

CTI has assessed the claims and assumptions made in the Joint-PD-MR, i.e., assumptions regarding the determination of baseline scenario, the investment analysis and additionality assessment, as well as validated the assumptions, limitations, and methods used for determining parameters and calculation of baseline emission, project emission and leakage against the VCS Standard Version 4.4/64/, applied methodology ACM0010 Version 08/51/, applicable tools /52/-/59/ and other VCS rules /60/-/64/. It is confirmed that the assumptions made in the Joint-PD-MR are reasonable which are in line with the applied methodology and tools as well as the requirement of VCS. The project is expected to generated average GHG emission removal of 42,657 tCO_2e per year, and it is confirmed that outcome of future activities will be achieved as the assumptions and limitations are reasonable.

The assessment was conducted to provide a reasonable level of assurance of compliance against the defined audit criteria and materiality threshold within the audit scope. Based on the VCS validation conducted, CTI is of the opinion that the project complies with the validation criteria for projects set out in VCS Standard Version 4.4, including any qualifications or limitations.

1.4. Summary Description of the Project

The project is implemented by Hui County Xingjiang Muge Breeding Co., LTD., which aims to replace the current open anaerobic lagoons with a new Animal Manure Management Systems featuring closed anaerobic digesters at the existing swine farm in Gansu Province.This system will

treat the manure and wastewater from the swine farm to avoid methane emissions generated in the baseline uncovered anaerobic lagoons.

The AWMS has been installed in the swine farm to treat the manure and wastewater from the 41,935 heads of market swine 5,885 heads of breeding swine. The raw materials such as pig manure and wastewater are collected into waste collecting tanks and then be separated first by Solid-liquid separators. The solid are treated in aerobic composting system, and the organic fertilizers are produced. The liquid is treated through anaerobic digestion and the biogas generated during the treatment process is captured for heat generation.

The anaerobic tanks utilize Continuous Stirred-Tank Reactor (CSTR) as its anaerobic digester technology. The biogas generated from the anaerobic digesters, after desulfurization and purification, is sent to biogas boilers. The heat generated is used for the daily operation of the AWMS and the swine farm.

The swine live in the farm for 150 days before shipment and the swine lived in the farm a year are expected to produce 29,674.5 tons of manure and $482.59*10^4 m^3$ of biogas annually. The recovered is combusted for heat generation and used for daily operation of AWMS and the swine farm, with any residual biogas being flared. For conservativeness, baseline emissions from thermal energy generation are neglected. The sludge produced from anaerobic digestion are treated through aerobic composting together with the solid, the effluent is used for agriculture irrigation which has been confirmed by site inspection and checking the PER of the project/5/. By examining the renunciation statement of emission reductions generated by replacing coal heating with biogas heating/35/, CTI confirms that PP will not register and apply for emission reductions due to the use of biogas heat replacing coal heat.

The project activity enables the existing swine farm to use new AWMS instead of the open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the swine manure, finally generate the heat to swine farm and the AWMS, which has been verified by on-site inspection, and checking the related documentations, interview with the project implementer.

The project is expected to avoid GHG emission of methane from anaerobic treatment of swine manure and wastewater through recovery and destruction of biogas. The estimated emission reduction from the project is 298,604 tCO_2e per year during the first crediting period from 01/06/2021 - 31/05/2028.

The project activity generates GHG emission reductions by avoid GHG emission of methane from anaerobic treatment of swine manure and wastewater. Thus the project generates GHG emission reductions and produces financial, social and environmental benefits. The project has resulted in the local sustainable development as described in Section 1 of the Joint-PD-MR/1/. The project applied to be registered as a VCS project activity and the 58,604 tCO_2e of emission reductions

have been certified as verified carbon units (VCUs) for 1st monitoring period from 01/06/2021 to 31/01/2023.

2 VALIDATION AND VERIFICATION PROCESS

2.1 Method and Criteria

A project specific validation and verification plan was developed to guide the validation and verification auditing process to ensure efficiency and effectiveness.

The purpose of the validation and verification is to present a risk assessment for determining the nature and extent of validation and verification procedures necessary to ensure the risk of auditing error is reduces to a reasonable level. According to the ISO14064-3, the criteria are the policy, procedure or requirement used as reference against which evidence is compared. The validation and verification were performed through means of the following three phases in accordance with the requirement of the applied methodology, and VCS Standard (version 4.4) and other relevant VCS requirements.

- A desk review of the Joint-PD-MR and all support documents;
- Follow-up interviews with project stakeholders and site inspection;
- The resolution of outstanding issues and the issuance of the joint validation and verification report and statement.

The date and details of the site visit are in Section 2.3. And CTI completed a strategic review and risk assessment of the project's activities and processes in order to gain a full understanding of (if applicable):

- Project Details;
- Application of Methodology;
- Estimated GHG Emission Reduction and Removals;
- Monitoring;
- Safeguards etc.

CTI also verified the emission reductions through assessing all factors and issues that constitute the basis for emission reductions from the project, including:

- The emission reduction calculations and the relevant data records;
- The calibration and maintenance records for the monitoring instruments;
- The management systems to support the project operation and monitoring.

CTI assessed that the reported information in the Joint-PD-MR are complete and accurate in question. This joint validation and verification report describes the findings of this assessment. The information of the assessment team has been included in below of this report.

2.2 Document Review

The Joint-PD-MR /1/ and supporting background documents related to the project implementation were reviewed. Documents review was conducted to ensure consistency with and identify any deviation from VCS program requirements. Desk review included an examination of the project design details, baseline scenario, additionality, ex ante and monitoring data and parameters, and ex ante quantification of GHG emission reductions. The assessment team also used additional documentation by third parties like host party legislation, technical reports referring to the project design details, baseline scenario, additionality, monitoring or to the basic conditions and technical data.

Furthermore, the Joint-PD-MR /1/ and emission reduction calculation spreadsheet of monitoring period from 01/06/2021 to 31/01/2023, relevant decisions, clarifications and guidance from the Verra, other information and references relevant to the project activity have also been assessed.

During the desk review, CTI has applied standard auditing techniques to assess the quality of information provided, including a review of the data and information presented to verify their completeness; a review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the quality assurance and quality control procedures; and an evaluation of data management and the quality assurance and quality control system in the context of their influence on the generation and reporting of emission reductions.

The references used in the course of this validation and verification are summarized in Appendix 2. The validation and verification were performed basing on the documents check and site inspection/measurements, refer to the section 3 of this report for the validation process detail, section 3 of this report for the verification process detail, Section 4 of this report for the verification process detail.

According to the sectoral scopes / technical area and experiences in the sectoral or national business environment, CTI has composed a project assessment team in accordance with the

appointment rules in CTI. The composition of CTI assessment team has to be approved by the CTI ensuring that the required skills are covered by the team. The four qualification levels for team members that are assigned by formal appointment rules as below:

Function	Name	Technical competence	Task Performance*
Team Leader	Zhang Lei	1, 4, 13	☒ DR ☒ SV ☒ RP ☐ TR
Team member	Zhang Wenting	1.2	☒ DR ☒ SV ☒ RP ☐ TR
TR Expert	Lin Shunrong	1, 13, 14, 15	☐ DR ☐ SV ☐ RP ☒ TR

*DR=Document review; SV=Site visit; RP=Reporting; TR=Technical review

2.3 Interviews

Describe the interview process and identify personnel, including their roles, who were interviewed and/or provided information additional to that provided in the Joint-PD-MR/1/ and any supporting documents.

The objective of the interview process was to solicit important information from personnel related to project and relevant to the validation and verification process. Onsite interviews and information discussions were conducted with representatives from project implementer/I1/, Operation Staffs of the AWMS, local officers, local residents, and VCS consultant. The interviews were performed by the validation and verification team on-site (within the project area, in Gansu Province, P.R. China) and the key personnel interviewed, and the main topic of the interviews are summarized in the table below:

Interviewed personnel	Role	Organization	Subject	Team Member
Wei Hongzheng	Managing Director/Project Manager	Hui County Xingjiang Muge Breeding Co., LTD.	Status of the project (including PPs); Applicability of selected methodology; Baseline of the project and its	Zhang Lei Zhang Wenting

Qiu Tingting	Site Manager		updates; Emission factors and their updates; Monitoring plan; Stakeholder consultation process and its outcomes; Operation of the project activity; Implementation of the monitor plan of the project activity; Data collection and data achievement; Calibration of meters and equipment maintenance; Data collection and ER calculation; Social and Environmental impacts; Compliance with relevant laws.	
Tian Jiaxing	Operations and Maintenance Manager			
Liang Bo	Finance Manager			
Li Hui	Local resident	Longnan City	The process and participation of the stakeholder consultation; The impact of the project activity; The complaint by local stakeholders and the implementation of the mitigation measures.	Zhang Lei Zhang Wenting
Liu Jiaren	Local resident			
Yuan Juan	Officer	Local Environment Protection Bureau		
Xia Senlin	Officer			
Zhou Zhiwu	Project Leader	Baineng New Energy (Shenzhen) Co.,Ltd.	Data collection and ER calculation.	Zhang Lei Zhang Wenting
Xiao Renqian	Project Manager			

2.4 Site Inspections

On 04/04/2023, CTI Assessment Team visited Hui County Xingjiang Muge Breeding Co., LTD. and performed the on-site validation and verification at the project location and the swine farm. The interviewed personnel and objective are listed in above table.

During the on-site validation and verification, CTI has applied standard auditing techniques to assess the quality of information provided, the implementation and current situation of the project activity, evaluate data management, QA/QC system, project technology and equipment, training provided, and monitoring etc.

2.5 Resolution of Findings

As an outcome of the validation process, the team can raise different types of findings.

Where a non-conformance arises the assessment team shall raise a Corrective Action Request (CAR). A CAR is issued, where:

a) Non-compliance with the monitoring plan or methodology are found in monitoring and reporting and has not been sufficiently documented by the project participants, or if the evidence provided to prove conformity is insufficient;

b) Modifications to the implementation, operation and monitoring of the project activity has not been sufficiently documented by the project participants;

c) Mistakes have been made in applying assumptions, data or calculations of emission reductions that will impact the quantity of emission reductions;

d) Issues identified in a FAR during validation to be verified during verification or previous verification(s) have not been resolved by the project participants.

The assessment team shall raise a Clarification Request (CL) if information is insufficient or not clear enough to determine whether the applicable CDM or VCS requirements have been met.

All CARs and CLs raised during validation shall be resolved prior to submitting a request for issuance.

The objective of this phase of the validation was to resolve the requests for corrective actions and clarification and any other outstanding issues which need to be clarified for CTI's positive conclusion on the Joint-PD-MR /1/. 8 Clarification Requests (CLs) and 10 Corrective Action Requests (CARs) were raised and successfully closed. No Forwarded Action Requests (FARs) was raised by CTI. And communications were made between the Client and CTI to guarantee the transparency of the validation and verification process, the concerns raised, and responses given are summarized below in the appendix 4.

The final Joint-PD-MR (Version 02 dated 30/04/2023) serves as the basis for the final assessment presented. Additional changes to the project during the validation and verification process are not

considered to be significant with respect to the main CDM/VCS objectives. The two CDM/VCS main objectives are the reduction of anthropogenic GHG emissions and the contribution of sustainable development to the host country.

Areas of validation and verification findings	No. of CL	No. of CAR	No. of FAR
Project Description and monitoring report	2	1	0
Description of project activity	1	1	0
Application of selected baseline and monitoring methodology and selected standardized baseline	---		
- Applicability of methodology and standardized baseline	0	0	0
- Deviation from methodology	0	0	0
- Clarification on applicability of methodology, tool and/or standardized baseline	1	0	0
- Demonstration of additionality	1	3	0
- Emission reductions	1	2	0
- Monitoring plan	1	1	0
- Stakeholders consultation process	0	0	0
- SDG	1		0
- Public comments	0	0	0
Others (please specify) - Matter related to double counting - for validation	0	0	0
Others (please specify) - Matter related to Emission reduction calculation - for verification	1	2	0
ER achieved, Matter related to feeder details, breakdown and Calibration - for verification	1	0	0
Total	8	10	0

2.5.1 Forward Action Requests

None FAR was raised during the validation process.

3 VALIDATION FINDINGS

3.1 Project Details

Project type, technologies and measures implemented, and eligibility of the project

- *Type*

Through the onsite visit, interviewing the project developer and reviewing the Joint-PD-MR/1/, it was confirmed that the project aims to replace the current open anaerobic lagoons with a new Animal Manure Management Systems featuring closed anaerobic digesters at the existing swine farm in Gansu Province. The system will treat the manure and wastewater from the swine farm to avoid methane emissions generated in the baseline uncovered anaerobic lagoons and the biogas produced is recovered and combusted for heat generation and used by the swine farm and AWMS.

Therefore, it was confirmed that the sectoral scope are Scope 13 Waste handling and disposal and Scope 15 as per ACM0010 (Version 08), the UNFCCC Standard "Applicability of sectoral scopes version 01.0"/65/ and para. A.1.2 in Appendix 1 of VCS standard (V4.4)/64/.

It was confirmed that the project is not a grouped project.

- *Technologies and measures implemented*

The information and descriptions reported in section 1.1 of the VCS Joint-PD-MR/1/ have been checked.

The project is implemented by Hui County Xingjiang Muge Breeding Co., LTD. which aims to replace the current open anaerobic lagoons with a new Animal Manure Management Systems featuring closed anaerobic digesters at the existing swine farm in Gansu Province. The system will treat the manure and wastewater from the swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons.

By reviewing the swine farm's the record certificate /10/, the start order /11/, construction contract /12/, the invoices for swine purchased in 01/2021 /13/, the photos of the uncovered anaerobic lagoon /31/ and on-site interview with PP, the assessment team confirmed that before the commencement of this project, the waste from the swine farm was managed by an uncovered anaerobic lagoon measuring 100m x 90m x 4m.

The AWMS has been installed in the swine farm to treat the manure and wastewater from the 41,935 heads of market swine 5,885 heads of breeding swine. The raw materials such as pig manure and wastewater are collected into waste collecting tanks and then be separated first by Solid-liquid separators. The solid are treated in aerobic composting system, and the organic

fertilizers are produced. The liquid is treated through anaerobic digestion and the biogas generated during the treatment process is captured for heat generation.

The anaerobic tanks utilize CSTR as its anaerobic digester technology. The biogas generated from the anaerobic digesters, after desulfurization and purification, is sent to biogas boilers. The heat generated is used for the daily operation of the AWMS and the swine farm.

The swine live in the farm for 150 days before shipment and the swine lived in the farm a year are expected to produce 29,674.5 tons of manure and $482.59*10^4 m^3$ of biogas annually. The recovered is combusted for heat generation and used for daily operation of AWMS and the swine farm, with any residual biogas being flared. For conservativeness, baseline emissions from thermal energy generation are neglected. The sludge produced from anaerobic digestion are treated through aerobic composting together with the solid, the effluent is used for agriculture irrigation which has been confirmed by site inspection and checking the PER of the project/5/. By examining the renunciation statement of emission reductions generated by replacing coal heating with biogas heating/35/, CTI confirms that PP will not register and apply for emission reductions due to the use of biogas heat replacing coal heat.

The technology is confirmed by site inspection and checking the PER/5/, Construction contract/14/, Equipment purchase contracts/8/, Technical agreement of main equipment/14/ and Technical flow chart/15/.

The project enables the existing swine farm to use new AWMS instead of the open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the swine manure, finally generate the heat to swine farms and AWMS, which has been verified by on-site inspection, and checking the related documentations, interview with the project implementer. The technology employed is environmentally safe and sound as well as state of the art. Via checking the Business License/4/of PP, Construction contract/14/, Equipment purchase contracts/8/, it is verified that project owner invested in purchasing the AWMS for the swine farm and owned the swine farm. By implementing the project, it has provided an opportunity for local community to generate steady and continual income for their livelihood.

The project is applicable to the applied CDM Methodology ACM0010 "GHG emission reductions from manure management systems" (Version 08.0)/51/.

The expected total emission reduction of the project in the crediting periods of 7 years (01/06/2021 - 31/05/2028) is 298,604 tCO_2e, and the annual emission reduction is estimated to be 42,657 tCO_2e.

In conclusion, it is verified that the summary description of the project in section 1.1 is in line with the Joint-PD-MR template requirements and all the information has been provided and verified as correct.

- *Eligibility of the project activity*

The PP has described and justified how the project is eligible under the scope of the VCS Program in Joint-PD-MR as per the section 2.1.1 of VCS Standard Version 4.4. The assessment is provided as below,

1. The project activity generates GHG emission reductions including CH_4 and N_2O which belong to the six Kyoto Protocol greenhouse gases.

2. "The scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction." Via checking the Joint-PD-MR/1/ of the project, it is verified that the project is implemented to introduce new Animal Manure Management Systems by replace the current open anaerobic lagoons with one new set of closed anaerobic digesters to the existing swine farms in Gansu Province, which will treat the manure and wastewater from the swine farm to avoid methane emissions generated in the baseline uncovered anaerobic lagoons, and the additionality is verified as actual, thus there is no assumption of having generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction for this project.

3. The VCS Program also excludes the following project activities under the circumstances indicated in Table 1 of section 2.1.1 of VCS Standard Version 4.4, via checking all the excluded project activities in the table, it is verified that this project type is not excluded by the scope of VCS program.

In conclusion, the project is eligible to the scope of the VCS Program.

Project design, including eligibility criteria for grouped projects

The project activity involves the construction and operation a new AWMS in one existing swine farm in Gansu Province owned by Hui County Xingjiang Muge Breeding Co., LTD.

The project has not been designed to include a single installation of an activity, multiple project activity instances, or as a grouped project. This project activity is not a grouped project.

Project Proponent and other entities involved in the project

The project proponent (Hui County Xingjiang Muge Breeding Co., LTD.), and the contact information reported in section 1.5 of the VCS Joint-PD-MR/1/ have been confirmed to be correct through checking the business license of the company/4/, Construction contract/14/, Equipment purchase contracts/8/, Approval of EIA/7/ and interviewing with the PP representative through the on-site visit.

The other entities involved in the Project (Baineng New Energy (Shenzhen) Co.,Ltd.) and the contact information reported in section 1.6 of the VCS Joint-PD-MR have been confirmed to be correct through checking the business license of the Baineng New Energy (Shenzhen) Co.,Ltd./4/ and interviewing the representative of this company during the on-site visit.

Ownership

The section 1.7 of the Joint-PD-MR has been checked, it is confirmed that the Project Proponent demonstrates that they have the legal right to control and operate project activity.

Via checking the National legal approval of EIA/7/, Equipment purchase contracts/8/ and the business license of the Hui County Xingjiang Muge Breeding Co., LTD./4/, it is verified that the PP has the legal right to control and operate the project activity. Thus, it is confirmed that the project owner has the ownership of the project.

Project Start Date

The project start date is 01/06/2021 which is verified as the date on which the project began generating GHG emission reductions or removals as per the concept in VCS Standard Version 4.4.

Via checking the equipment purchase contracts/8/ and equipment installation acceptance certificate/9/ and the operation log of the AWMS plant/15/, it is verified that 01/06/2021 is the date when the AWMS has been put into operation. This is the start date when the project began avoiding manure treatment in uncovered anaerobic lagoons and started generating emission reductions. Hence the start date is correct and in line with the VCS standard.

Project Crediting Period

For the VCS crediting period, PP has chosen seven years (twice renewable for a total of up to 21 years), and the first crediting period is 01/06/2021 - 31/05/2028 which is in line with the concept for crediting period in section 3.8.2 of the VCS Standard Version 4.4.

Project Scale and Estimated GHG Emission Reductions or Removals

As the estimated annual average GHG emission reductions per year is 42,657 tCO_2e which is lower than 300,000 tCO_2e, the project classified as "Project" under VCS standard. And the total estimated GHG emission reductions during the first VCS crediting period (01/06/2021 - 31/05/2028) is 298,604 tCO_2e.

Through checking emission reductions calculation spreadsheets /2/ provided by PP, the assessment team was able to confirm that the estimated GHG emission reductions of the project activity are as follows:

Year	Estimated net GHG emission reductions or removals (tCO_2e)
01/06/2021~31/12/2021	25,000*
01/01/2022~31/12/2022	42,641
01/01/2023~31/12/2023	42,641
01/01/2024~31/12/2024	42,641

01/01/2025~31/12/2025	42,641
01/01/2026~31/12/2026	42,641
01/01/2027~31/12/2027	42,641
01/01/2028~31/05/2028	17,755**
Total	298,604
Total number of crediting years	7 years
Average annual ERs	42,657

*: There are 214 days from 01/06/2021~31/12/2021. Thus, the estimated ERs are calculated as 42,641 tCO_2e /365d*214d=25,000 tCO_2e.

**: There are 152 days from 01/01/2028~31/05/2028.Thus, the estimated ERs are calculated as 42,641 tCO_2e /365d*152d=17,755 tCO_2e.

Project location

The project is situated in Wangzhuang Village, Chengguan Town, Hui County, Longnan City, Gansu Province, China, which is inside the existing swine farm. By cross-referencing the map with the GPS location during the on-site visit, the assessment team confirmed that the central geographical coordinates of the proposed project are 33°50'54.959352"N 106°5'28.195487"E.

Conditions prior to project initiation

Via checking the Joint-PD-MR/1/, it is confirmed that the scenario existing prior to the implementation of the project is the animal manure waste was left to decay in anaerobic manure management system (uncovered open lagoon) at the swine farm and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. By reviewing the swine farm's the record certificate/10/, the start order/11/, construction contract/12/ and the invoices for swine purchased in 01/2021/13/, CTI confirmed that the swine farm construction includes the construction of an uncovered anaerobic lagoon, and that the operation of the swine farm commenced on 01/01/2021. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity, which has also been confirmed during the site interview with PP and on-site checking the photo of baseline lagoon/31/. Thus it is verified that the baseline scenario is reasonable and correct.

And via site inspection and checking the related equipment purchase contracts/8/ and equipment installation acceptance certificate/9/, it is verified that all the equipment involved in animal manure management systems covered by the project were newly built and there was no existing manure management system prior to the project activity hence no existing equipment in baseline scenario.

Therefore, the project is confirmed not to be implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction.

Project compliance with applicable laws, statutes and other regulatory frameworks

The Joint-PD-MR has stated that the project is in the field of waste handling, this industry is confirmed as in line with the laws and regulations/82/ as listed in the Joint-PD-MR.

Also the project is legally approved by Local government by checking the EIA approval/7/, which means that the project is in line with the national and local laws and regulations based on the local expertise of the VVB. And as stated in the Joint-PD-MR/1/ and confirmed by interview with local officer, CTI verified that the project will be subject to regular inspection by local government during the implementation period to ensure continuous compliance.

In conclusion, the project complies with all relevant local, regional and national laws, statutes and regulatory frameworks in China.

Participation under other GHG programs

- *Projects registered (or seeking registration) under other GHG program(s)*

The project has neither been registered nor seeking registration under any other GHG programs which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website. It is verified that the project is seeking registration only in VCS program/68/.

- *Rejection by other GHG programs*

The project has neither been rejected by any other GHG programs which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website.

Other forms of credit and supply chain (Scope 3) emissions

- *Emissions trading programs and other binding limits*

The project proponent is not part of any emission trading program which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website. The net GHG emission reductions during this monitoring period from the project was not used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website, it is verified that the implementation of the project is consistent with the description in the Joint-PD-MR and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 01/06/2021 to 31/01/2023 which has been confirmed by checking the Declaration of no double counting and not involved in other GHG scheme/34/.

Besides, based on VVB's local expertise, China has a national emissions trading scheme only cover the high-emission industries, such as eight emission-intensive industries including power

generation, petrochemicals, chemicals, building materials, non-ferrous metals, papermaking, steel and aviation that emitted at least 26,000 tons of CO_2e/year which has been verified in the public website/71/, and it is confirmed that the project activity belongs to agriculture sector is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner by checking the enforced company list in public information/72/. On contrary, the project activity can reduce of GHG in the atmosphere through avoiding methane emissions from anaerobic treatment of swine manure and wastewater. Therefore, it can be concluded that the PP will not be included in the national ETS. Hence, it is confirmed that the emission reductions will not be double counted.

- *Other forms of environmental credit sought or received and eligible to be sought or received*

Via interview with the project developer and based on above assessment, it is confirmed that the project has not created any other form of environmental credit.

- *Issuance of public statement(s) to help prevent Scope 3 emissions double claiming*

NA

- *Email notification of the potential risk of Scope 3 emissions double claiming*

NA

Additional information relevant to the project

- *Leakage management for AFOLU projects*

The project activity is not a AFOLU project, therefore, this section is not applicable..

- *Commercially sensitive information*

No commercially sensitive information has been excluded from the public version of the project description. The details are presented transparently to validation team for analysis which lead to positive conclusion for this validation.

- *Sustainable development contributions*

Via the on-site inspection and by checking the evidence provided, CTI verified that the project contributes the sustainable development through the following aspects:

1. The project generated biogas during the treatment process are captured for heat generation are all used by the AWMS and the swine farm replace the coal-fired boiler (Goal 7 of UN SDG) – verified by checking the Daily operation record of the treatment plant/25/ and Emission Reduction Calculation sheet/2/, it is confirmed that 7,111,953 m^3 of biogas is generated by the project during this monitoring period, which avoid the methane emitted to the atmosphere and provide clean energy by utilizing biogas, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable.

The baseline emissions from thermal energy production have been ignored, and the emission reductions from replacing coal heat will not be registered and applied for, which is confirmed by the renunciation statement/35/;

2. The project activity creates Temporary and permanent job opportunities – verified by interview with staffs and checking the Labor Contracts/36/ and Employee list/37/, it is confirmed that 10 job opportunities have been provided during this monitoring period, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable.

3. Sequester greenhouse gas and mitigate climate changes (Goal 13 of UN SDG) – 58,604 tCO_2e GHG emission reductions have been achieved, which is verified by checking the Emission Reduction Calculation sheet/2/, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable.

Based on above assessment and demonstration, it is concluded that the description in the project description is accurate, complete, and the nature of the project is actual and understandable, and it is confirmed that the project has been implemented as described in the project description via site inspection.

3.2 Participation under Other GHG Programs

The project has neither been registered nor seeking registration under any other GHG programs which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website.

It is verified that the project is seeking registration only in VCS program/68/.

3.3 Safeguards

3.3.1 No Net Harm

In China, an Environmental Impacts Assessment is required according to Chinese legislation. The EIA was designed by Sichuan Tiyan Environmental Protection Technology Ltd./6/ and approved by Longnan Ecological Environment Bureau on 22/02/2021/7/. The analysis of the environmental impacts of the project activity is sufficiently described according to EIA report/6/. The assessment is as below:

It is considered that the environmental impacts and the relevant mitigation methods have been comprehensively described in Section 2.3 of Joint-PD-MR including the air pollution and wastewater, noise, and solid waste impact on the ecosystem and environment of local area in project site for both construction and operation period according to the EIA report/6/.

Associated with the review of EIA report/6/, there was no adverse effect on the air, water and solid waste, for the project subject to the implementation of pollution mitigation measures according to the EIA report/6/. There was also no any endangered species found in the project location.

As per the approval of EIA/7/, it stated that the inspectors from the local Environmental Protection Bureau have to carry out monitoring work for the environmental impact arisen from the project activity during project commissioning periodically. Via interview with the local officers from local Environmental Protection Bureau, CTI confirmed that they are satisfactory with the environmental protection and recovery work carried out by the project owner. The local Environmental Protection Bureau also did not receive any public comment on the project activity during this monitoring period.

During the on-site interview, the local residents were interviewed if there was critical impact to their living environment. It is verified that the project activity does not cause adverse effect to their daily life.

Furthermore, via interview with local officer and stakeholders, it is confirmed that the implementation of the project will improve local socio-economic development through creating career opportunities.

In conclusion, there were some impacts on environment during the construction and operation periods which has been demonstrated in the Joint-PD-MR/1/ and EIA/6/, also the proper measurements have been carried out by project implementer to mitigate such impacts.

3.3.2 Local Stakeholder Consultation

Local stakeholder consultation prior the project started construction

A stakeholder survey was carried out by the project developer on 16/03/2021 which was prior to the start date of the construction.

During the survey, total of 60 questionnaires were issued for this project and 60 copies were collected. The stakeholders' background information, survey process, and final comments and response from PP were summarized and recorded in the Joint-PD-MR, Section 2.2.

Via checking the 60 filled questionnaires/32/, it is verified that most respondents knew or heard about the Project. Most of them are supportive of the project construction, and think the Project will bring more benefit than loss. And the survey shows that many local stakeholders think the Project will help improve the life of local people and promote local economic development without any adverse environmental impact and 100% of respondents support this project.

Finally, it is verified that no negative comments raised from local stakeholders by checking the 60 filled questionnaires/32/ and thus no need to change the project design based on the stakeholder inputs.

Mechanism for on-going communication and consultation during this monitoring period:

During the implementation stage of this monitoring period, via checking the Input / Grievance Expression Process Book and the photos of public announcements/29/, and interview with the local officer and local residents during site visit, it is confirmed that the PP has conducted follow-up interviews and ongoing communication with local stakeholders to collect any comments or inputs to the project implementation. Based on the VVB's local expertise, CTI confirmed that the local government agencies and competent authorities will conduct spot checks on the implementation of the project from time to time as per the request from the local government's regulations.

Moreover, the project owner carried out a questionnaire survey for the local stakeholder to collect the relevant comments and suggestions from 12/08/2022 to 22/08/2022 during this 1st monitoring period, and project proponent put up public announcements at the villages near the project site about the survey including general information about the introduction of project, the date and the purpose of the questionnaire survey as well as the project proponent's phone number and email address from 01/08/2022 to 10/08/2022 which is confirmed by interview with the local stakeholders.

Via checking the 30 filled questionnaires/33/, interview with the local officer and local stakeholders during site visit, it is verified that nearly all the respondents believe that the Project will not have any negative environmental impact. It is verified that all local stakeholders who participated the survey were satisfied with the implementation of the project which has been confirmed by site interview with local stakeholders. The local officers from Environment Protection Bureau has confirmed that the project was under supervised and the implementation of the project is in line with the local environment protection regulations and EIA/6/ And via checking the 30 filled questionnaires/33/, it is confirmed that no other negative impacts considered by local stakeholder to their local life.

Via interview with the local officer and local residents during site visit, it is verified that there were no comments and issues from the local stakeholders during the implementation period and the project passed all the periodic spot checks by local government. Hence there is no need to change the project design based on the stakeholder inputs.

Furthermore, via site inspection, CTI confirmed that a grievance book was put at the entrance of the swine farm so that to collect the grievances or comments from local stakeholders anytime, and via checking the book, CTI verified that there was no any grievances or comments received during this monitoring period.

3.3.3 Environmental Impact

In China, an Environmental Impacts Assessment is required according to Chinese legislation. The EIA was designed by Sichuan Tiyan Environmental Protection Technology Ltd./6/ and approved by Longnan Ecological Environment Bureau on 06/11/2020/7/. The analysis of the environmental

impacts of the project activity is sufficiently described according to EIA report/6/ The assessment is as below,

It is considered that the environmental impacts and the relevant mitigation methods have been comprehensively described in Section 2.3 of Joint-PD-MR including the air pollution and wastewater, noise, solid waste and impact on the ecosystem in local area of project site according to the EIA report/6/.

The environmental impacts of the project were sufficiently assessed by means of an EIA study report according to the Chinese laws & regulations such as "Environmental Protection Law of P.R. China"/82/ and "Law of the People's Republic of China on the Environmental Impact Assessment" /82/. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project construction and operation.

During the construction period, via interview with the local officer from environmental protection bureau, it is confirmed that the potential environmental impacts have been sufficiently identified for the construction period, such as air pollution, wastewater, noise and solid waste etc. The conclusion of the analysis has been described in the Joint-PD-MR as per the EIA report/6/ and the related mitigation measures have been listed as per the approval of EIA report/7/. Due to the project has been implemented during the site inspection, it is confirmed that the impact during the construction period has been solved and no significant environmental impacts are expected from the project activity.

Associated with the review of EIA, there was no adverse effect on the ecology, air, water and solid waste, for the project subject to the implementation of pollution mitigation measures according to the EIA report. There was also no any endangered species found in the project location.

Via interview with the local officers from local Environmental Protection Bureau, it is confirmed that they are satisfactory with the environmental protection and recovery work carried out by the project owner. The Environmental Protection Bureau also did not receive any public comment on the project activity after the implementation of the project.

3.3.4 Public Comments

The project sought the registration with the VCS Program, according to VCS requirements the Project Description was submitted for public comment period. The project was allocated with VCS ID 3950. The public comment period started on 09/01/2023 and ended on 08/02/2023 (https://registry.verra.org/app/projectDetail/VCS/3950).

No comments were received during this period which has been verified by checking the dedicated website as above.

3.3.5 AFOLU-Specific Safeguards

The project activity is not an AFOLU project. For non-AFOLU projects, this section is not required.

3.4 Application of Methodology

3.4.1 Title and Reference

The approved consolidated methodology applied in the project activity is ACM0010–"GHG emission reductions from manure management systems" (version 08.0)/51/.

This methodology also refers to the latest approved version of the following tools and guidelines:

Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)/52/

Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/53/

Tool 06 Project emissions from flaring (Version 04.0)/54/

Tool 07 Tool to calculate the emission factor for an electricity system (Version 07.0)/55/

Tool 08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version03.0)/56/

Tool 14: Project and leakage emissions from anaerobic digesters (Version 02.0)/57/

Tool 24 Common practice (Version 03.1)/58/

3.4.2 Applicability

Demonstration regarding the applicability of the methodology, and any tools selected by the project proponent as provided in below table.

Table 3-1 Assessment of Applicability conditions of ACM0010 (Version 08).

No.	Criteria	Validation Assessment	Conclusion
1	This methodology applies to project activities that include destruction of methane emissions and displacement of a more GHG-intensive service in manure management of livestock farms by introducing a new animal waste management system or a combination of animal waste management systems that result in less GHG emissions.	Via site inspection and checking the PER/5/, related equipment purchase contracts/8/ and Construction contract/14/, CTI verified that this project activity is installing one set of new animal waste management systems to treat the manure and wastewater from the new swine farm to avoid methane emissions generated in the baseline uncovered	Applicable

No.	Criteria	Validation Assessment	Conclusion
		anaerobic lagoons. Hence this criteria is applicable for this project activity.	
2	This methodology is applicable to manure management on livestock farms where the existing anaerobic manure treatment system, within the project boundary, is replaced by one or a combination of more than one animal waste management systems (AWMSs) that result in less GHG emissions compared to the existing system. The methodology is also applicable to Greenfield facilities.	Via site inspection and checking the PER/5/, related equipment purchase contracts/8/ and Construction contract/14/, CTI verified that the project activity is a greenfield facility and that a new animal manure management system was installed at the time of swine farm construction to treat manure and wastewater from the farm to avoid methane emissions from uncovered anaerobic ponds on the farm, resulting in lower greenhouse gas emissions compared to the existing system.	Applicable
3	This methodology is applicable to manure management projects under the following conditions: a) Farms where livestock populations, comprising of cattle, buffalo, swine, sheep, goats, and/or poultry, is managed under confined conditions; b) Farms where manure is not discharged into natural water resources (e.g. rivers or estuaries); c) In case of anaerobic lagoons treatments systems, the depth of the lagoons used for manure management under the baseline scenario should be at least 1 m; d) The annual average ambient temperature at the site where the anaerobic manure treatment facility in the baseline existed is higher than 5°C; e) In the baseline case, the minimum retention time of manure waste in the	(a) Via site inspection and checking the Licenses for production and operation of the breeding livestock and poultry/8/ for the swine farm, and furthermore via checking the public information of the project owner/67/ and based on the local expertise of validation team, CTI confirmed that the project owner is one of the national leading agricultural enterprise with the largest scale of swine farming in China, CTI confirmed that all the livestock population in the swine farm within the project boundary is managed under confined conditions. (b) All the swine manure is dumped into AWMS and are not discharged into natural water resources. This is verified by checking the Licenses for	Applicable

No.	Criteria	Validation Assessment	Conclusion
	anaerobic treatment system is greater than one month; f) The AWMS(s) in the project case results in no leakage of manure waste into ground water, for example the lagoon should have a non-permeable layer at the lagoon bottom.	production and operation of the breeding livestock and poultry/8/ and related “Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming”/84/. (c) Section 3.4 of the Joint-PD-MR describes the baseline scenario for manure treatment on the new swine farm as an anaerobic lagoon. And the depth of the open lagoons used for manure management under the baseline scenario is 3~5 meters higher than 1m. This is verified by checking the national standard “Design code for wastewater stabilization ponds (GJJ/T54-93)”/39/. (d) The annual average temperature of baseline site where anaerobic manure treatment facility is located is 13°C which is higher than 5°C. This is verified by checking the public information of local temperature/75/. (e) In the baseline scenario the retention time of manure waste in the anaerobic lagoons is not less than 45 days, i.e. at least 60 days and not more than 90 days. This is verified through site visits with environmental officials and relevant literature/86/. (f) The manure from project will be utilized to produce fertilizer after methane capture, hence	

No.	Criteria	Validation Assessment	Conclusion
		there is no leakage of manure waste into ground water occurred which is confirmed by site inspection and checking the produced fertilizer. Via checking the Technical agreement of anaerobic tank/14/, it is verified that the tanks are totally enclosed without any leak can be found, thus will not cause leakage of manure waste into ground water. Hence this criteria is applicable for this project activity.	
4	In addition, the applicability conditions included in the tools referred to below apply.	Refer to below assessments.	Applicable
Conclusion: Methodology ACM0010 (Version 08) is applicable to the project activity.			

In addition, the project meets the applicability conditions of the applied tools as follow table,

Table 3-2 Assessment of Applicability conditions of methodological tool

Tool	Criteria	Validation Assessment	Conclusion
(a) Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)	The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies. This could include, inter alia, a listing of relevant alternative scenarios that should be considered in Step 1, any relevant types of barriers other than those presented in this tool and guidance on how common practice should be established.	The tool is applicable to all types of proposed project activities, and in section 15 of the applied methodology, it requires project proponents determine the most plausible baseline scenario through the use of the "Combined tool to determine the baseline scenario and demonstrate additionality". Thus this tool is applicable to the project.	Applicable
(b) Tool 05 Baseline, project and/or leakage emissions from electricity	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.	Via site inspection, it is confirmed that the electricity consumption of the project will be supplied by the NCPG (Northwest China Power Grid), which	Applicable

Tool	Criteria	Validation Assessment	Conclusion
consumption and monitoring of electricity generation (Version 03.0)	The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (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.	falls under scenario A. Therefore, emissions related to electricity consumption need to be calculated based on Tool 05.	
	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 grid and consumers/electricity consuming facilities.	N/A	N/A
	This tool is not applicable in cases where captive renewable power generation technologies are installed to	Via checking the ER calculation process, it is confirmed that Tool 05 is only used to calculate project emissions of	Applicable

Tool	Criteria	Validation Assessment	Conclusion
	provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	electricity consumption supplied by NCPG. For conservativeness, baseline emissions of captive biogas heat generation system are ignored. Only CO_2 emissions will be accounted.	
Tool 06 Project emissions from flaring	This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the CDM-PDD the type of flare used in the project activity.	The project uses open flare system which has been confirmed by site inspection of the open flares in the swine farm. Hence this criteria is applicable for this project activity.	Applicable
	This tool is applicable to the flaring of flammable greenhouse gases where: (a) Methane is the component with the highest concentration in the flammable residual gas; and (b) The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).	Methane is the component with the highest concentration in the biogas (methane accounts for 60% of the biogas) flared in the project which has been confirmed by site inspection and checking the PER/5/. Hence this criteria is applicable for this project activity.	Applicable
	The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. For the case of an open flare, there shall be operating specifications provided by the manufacturer of the flare.	The project does not use auxiliary fuels which has been confirmed by site inspection of the project implementation and checking the PER/5/. Hence this criteria is applicable for this project activity.	Applicable
Tool 07 Tool to calculate the emission factor for an electricity system (Version 07.0)	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid	Through interview and checking PER, it is confirmed by the assessment team that the electricity consumed by the project is supplied by the grid NCPG. OM, BM and CM are estimated using the tool for calculating baseline emissions for the project activity.	Applicable

Tool	Criteria	Validation Assessment	Conclusion
	(e.g. demand-side energy efficiency projects).		
	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	It is confirmed by the assessment team that the electricity consumed by the project is supplied by the grid NCPG. The emission factor for the project electricity consumed is calculated for grid power plants.	
	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Upon verification via the UNFCCC website/87/, it has been confirmed that China is categorized as a non-Annex I country under the UNFCCC.	
	Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	Via checking the ER calculation process, it is confirmed that Tool 07 is only used to calculate the combined margin emission factor for the grid used in project emissions due to electricity consumption. For conservativeness, baseline	

Tool	Criteria	Validation Assessment	Conclusion
		emissions of captive biogas heat generation system are ignored. Therefore, the project does not involve CO_2 emission factors for biofuels.	
Tool 08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version03.0)	Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions.	Via site inspection, CTI confirmed the amount of biogas collected at the digester will be collected and monitored. Hence this criteria is applicable for this project activity.	Applicable
	Methodologies where CO2 is the particular and only gas of interest should continue to adopt material balances as the means of flow determination and may not adopt this tool as material balances are the costeffective way of monitoring flow of CO2	It is confirmed that the biogas generated during the treatment process contains CH_4, H_2S, O_2, etc., hence the tool is used for determining the mass flow of a greenhouse gas. Hence this criteria is applicable for this project activity	
	The underlying methodology should specify: (a) The gaseous stream the tool should be applied to; (b) For which greenhouse gases the mass flow should be determined; (c) In which time intervals the flow of the gaseous stream should be measured; and (d) Situations where the simplification offered for calculating the molecular mass of the gaseous stream (equations (3) or (17) is not valid (such as the gaseous stream is predominantly composed of a gas other than N2)	(a) The tool is confirmed applied in the Joint-PD-MR. (b) The mass flow has been determined in the monitoring plan of the Joint-PD-MR. (c) The flow of the gaseous stream will be measured continuously as determined in the monitoring plan of the Joint-PD-MR. (d) The gaseous stream is dry and related equations have been used to calculate the mass flow of greenhouse gas. Hence this criteria is applicable for this project activity.	
Tool 14: Project and leakage emissions from anaerobic digesters	The following sources of project emissions are accounted for in this tool: (a) CO2 emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) CO2	Sources of project emissions including (a) and (c) which involved in the project implementation have been accounted by checking the ER calculation sheet/2/. Hence	Applicable

Tool	Criteria	Validation Assessment	Conclusion
(Version 02.0)	emissions from consumption of fossil fuels associated with the operation of the anaerobic digester; (c) CH_4 emissions from the digester (emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester); and (d) CH_4 emissions from flaring of biogas.	this criteria is applicable for this project activity.	
	The following sources of leakage emissions are accounted for in this tool: (a) CH_4 and N_2O emission from composting of digestate; (b) CH_4 emissions from the anaerobic decay of digestate disposed in a SWDS or subjected to anaerobic storage, such as in a stabilization pond.	The biogas generated during the treatment process will be captured for heat generation. After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer which has been confirmed by site inspection of the project implementation and checking the PER/5/. By site inspection, CTI confirmed that there was no additional storage yard to store the sludge produced from anaerobic digestion. Therefore The leakage emissions associated with the anaerobic digester should not be taken into account for this project Hence this criteria is applicable for this project activity.	
	Emission sources associated with N_2O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources or because	N_2O emissions are neglected because these are minor emission sources via checking the applied methodology.	

Tool	Criteria	Validation Assessment	Conclusion
	they are accounted in the methodologies referring to this tool.		
Tool 24 Common practice (Version 03.1)	This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality	As assessed above, the project applies the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality" for the demonstration of additionality, the project can use the common practice test for the demonstration of additionality. Hence this criteria is applicable for this project activity.	Applicable
	In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail	Via checking the applied methodology, CTI confirmed that the methodology defines approaches for the conduction of the common practice test that are same to those described in this methodological tool. Hence this criteria is applicable for this project activity.	
Conclusion: All the relevant methodological tools are applicable to the project activity			

3.4.3 Project Boundary

The project boundary basically defines the physical and geographical boundary of the project facility and it is well defined in the Joint-PD-MR/1/ (section 3.3) according to ACM0010 GHG emission reductions from manure management systems (Version 08.0)/51/. The project boundary includes following,

Project boundary has been defined in the Joint-PD-MR according to the applied methodology ACM0010/51/ as the geographical extent of the project boundary includes the site of the AWMS, including the flare and heat generation equipment and the power source and considers the GHG emissions that come from AWMS, including the GHGs emissions from the anaerobic digestion, GHG emissions from sludge treatment by aerobic composting and GHG emissions from flaring system in the swine farm which is verified by checking the PER of the project/5/and on-site inspection.

Via site inspection and checking the PER/5/and the technical flow chart in the project site/15/, it is verified that project boundary is clearly defined in the Joint-PD-MR as per the methodology.

Emissions sources included in the project boundary have been appropriately included in the Joint-PD-MR. CH_4 and N_2O emissions due to emissions from the waste treatment processes is covered for baseline scenario and the project scenario has emissions due to on-site electricity use and CH_4 and N_2O emissions from the waste treatment processes.

It is concluded that the project boundary and selected sources are correctly justified for the project.

3.4.4 Baseline Scenario

The PP has applied an approved baseline and methodology ACM0010, version 08.0 which is approved under CDM scheme.

The JPM applies the stepwise approach as given by section 5.2 of the ACM0010/51/ and "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/52/.

Step 1: Identification of alternative to the project activity consistent with current laws and regulations

Step 1a: Define alternative scenarios to the project activity

Due to the the swine farms were existed before the project implemented, hence according to the applied methodology, for existing facilities, for the baseline alternatives for managing the manure, PP has listed the complete set of existing/possible manure management systems listed in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4, Chapter 10, Table 10.17) which is confirmed consistent with the IPCC/44/, and possible combinations of animal manure management systems have been taken into account.

No further scenario is considered reasonable under the given context. The alternatives are assessed by validation team as below

No.	IPCC Alternatives	Justification
1	The manure is collected from the pasture/Range/Paddock	Via site inspection, CTI confirmed that swine in this project are bred in confined barns rather than pasture/range/paddock. This alternative is ruled out.
2	Daily spread: Manure removed from confinement and applied to pasture within 24 hours of excretion	Via site interview with chief and staffs in swine farms, CTI confirmed that it is not possible to remove the manure and apply on a daily basis for such large-scale swine farms, hence this alternative is not economically attractive. This alternative is ruled out.
3	Solid Storage: The manure	Via site interview with chief and staffs in swine farms, CTI

	is disposed by solid storage.	confirmed that solid storage is a storage method of manure, not a disposal method, and not suitable for such large-scale swine farms for using of a scraping and flushing approach to remove manure which has large volumes of water, hence this alternative is not economically attractive. This alternative is ruled out.
4	Dry lot	Via site interview with chief and staffs in swine farms, CTI confirmed that dry lot is a storage method of manure, not a disposal method, hence this alternative is not economically attractive. This alternative is ruled out.
5	The manure is disposed as liquid/slurry.	Via site interview with chief and staffs in swine farms, CTI confirmed that this method is a storage method of manure, not a disposal method, and not suitable for such large-scale swine farms, hence this alternative is not economically attractive. This alternative is ruled out.
6	Uncovered anaerobic lagoon	Via site interview with chief and staffs in swine farms and by checking the photo of baseline lagoon/31/, CTI confirmed that this is the scenario prior to the project implementation and it is a kind of harmless treatment of manure as per the “Technical specification for sanitation treatment of livestock and poultry manure”/83/ which means the animal waste that has been treated by uncovered anaerobic lagoon can satisfy the above regulations. So, the uncovered anaerobic lagoon is an alternative baseline scenario.
7	Pit storage below animal confinements, <1month	Via site interview with chief and staffs in swine farms, CTI confirmed that this method is a storage method of manure, not a disposal method, and not suitable for such large-scale swine farms which need a lot of labour work, hence this alternative is not economically attractive. This alternative is ruled out.
	Pit storage below animal confinements,>1month	Via site interview with chief and staffs in swine farms, CTI confirmed that this method is a storage method of manure, not a disposal method, and not suitable for such large-scale swine farms and long time storage will generate the toxic fumes which may kill the pigs, hence this alternative is not realistic. This alternative is ruled out.
8	Anaerobic digester (Anaerobic digester-Aerobic Treatment system)	This is part of the project scenario, due to a single anaerobic process is not yet able to meet the requirements for the use of the waste and must be followed up with disposal, which requires the use of a combination of aerobic and anaerobic processes together, this method is confirmed as one of the most advanced manure

		management systems, but need high investment. This alternative is realistic for this step.
9	Burned for fuel	Via site interview with chief and staffs in swine farms, CTI confirmed that this method is not suitable for such large-scale swine farms that generate too much dung and urine daily, which hard to dry and burned for fuel.This alternative is ruled out.
10	Cattle and Swine deep Bedding, <1month	Via site interview with chief and staffs in swine farms, CTI confirmed that this method is a storage method of manure, not a disposal method, and not suitable for such large-scale swine farms as deep bedding is counter to achieving economies of scale associated with large animal counts, hence this alternative is not realistic. This alternative is ruled out.
	Cattle and Swine deep Bedding, >1month	
11	Composting - In-vessel	Via site inspection, CTI confirmed that the manure in this project is in liquid with large volume of water, hence this alternative is not realistic. This alternative is ruled out.
12	Composting - Static pile	Via site inspection, CTI confirmed that the manure in this project is in liquid with large volume of water will consume a great deal of electricity for forced aeration as the large quantity of swine manure, hence this alternative is not economically attractive. This alternative is ruled out.
13	Composting - Intensive windrow	Via site inspection, CTI confirmed that the manure in this project is in liquid with large volume of water will consume a great deal of electricity for forced aeration as the large quantity of swine manure, hence this alternative is not economically attractive. This alternative is ruled out.
14	Composting – Passive windrow	Via site inspection, CTI confirmed that this method would take a long time and occupies a large area of land, even emits strong odors and GHGs during turning, hence this alternative is not economically attractive. This alternative is ruled out.
15	Poultry manure with litter	Via site inspection, CTI confirmed that only large-scale swine farm involved in the project, no Poultry farm.
16	Poultry manure without litter	
17	Aerobic treatment (Anaerobic digester-Aerobic Treatment system)	Via site inspection, CTI confirmed that single aerobic treatment technique is not suitable for treating low concentration organic wastewater in wastewater. At present a combine Anaerobic Digester-Aerobic Treatment system is considered as one of the most advanced manure management systems, but to implement

		such technology need high invest and the proposed project will not be invested and constructed without being registered as a VCS project which has been demonstrated in the below step 3. Hence this alternative is not economically attractive. This alternative is ruled out.

Hence, based on above assessment, CTI confirmed that the remaining realistic and credible alternative scenarios for the new animal waste management system are

Scenario 6: "The manure is disposed in an uncovered anaerobic lagoon"

Scenario 8&17: "Anaerobic Digester-Aerobic Treatment i.e. the proposed project activity not being registered as a VCS project activity"

Step 1b: Consistency with mandatory applicable laws and regulations Via searching the public website with laws and regulations in Gansu Province and China by CTI, it is confirmed that there is no legal law and regulation to mandate the livestock farm owners to implement anaerobic digestion reactor, aerobic or other biological treatment techniques to treat the animal manure in China. And via checking the "Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming"/84/ and "Technical specification for sanitation treatment of livestock and poultry manure"/83/, CTI confirmed that the manure is prohibited to discharge directly into environment without any treatment and the uncovered anaerobic lagoon is a kind of manure treatment method recognized by the state.

Besides, the "Specifications for the construction of manure resource utilization facilities for large-scale livestock and poultry farms (for trial implementation)"/85/ has been checked and CTI confirmed that anaerobic digester, aerobic treatment or other biological treatment techniques methods to dispose manure waste are encouraged by the state and not mandatory.

As assessed above, CTI confirmed that the above options of Scenario 6 and Scenario 8&17 are considered to follow all mandatory applicable legal and regulatory requirements which are verified based in validation team's local expertise. The outcome of Step 1b is same to Step 1a.

Step 2: Barrier analysis

Based on above assessments, it is concluded that both the two alternatives have no technology barriers, acceptability barriers and financial barriers. Therefore, both alternatives come to Step 3.

Step 3: Investment analysis

The purpose of this step is to determine which one is economic attractive.

For each alternative, all cost and economic benefits attributable to the waste management scenario should be illustrated in a transparent and complete manner according to the Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)/52/.

Via checking the calculation formula and calculation process of the value of NPV and IRR in the calculation sheet/3/, CTI confirmed that the formula and inputs values are correct and actual by checking the PER/5/and Economic Evaluation Method and Parameter of Construction Projects version 03/47/, thus CTI verified that the calculation results of the NPV for scenario 6 and scenario 8&17 are correct.

By comparing with the results, CTI confirmed that the NPV of the project activity is far more negative than that of the uncovered anaerobic lagoon.

Hence the uncovered anaerobic lagoon is the most attractive course of action and is considered to be the baseline scenario.

Furthermore, for the project scenario, PP has analyzed the IRR value to prove that only get revenues from VCUs, the IRR/3/ of the project activity is higher than the benchmark.

Via checking the calculation formula and calculation process of the value of IRR in the calculation sheet/3/, CTI confirmed that the formula and inputs values are correct and actual by checking the PER/5/ and Economic Evaluation Method and Parameter of Construction Projects version 03/47/, thus CTI verified that the calculation results of the IRR for scenario 8&17 is correct and the final value of IRR of the project scenario without carbon revenue is 0.8% which is lower than the benchmark of 9.5%.

Benchmark of 9.5% is confirmed as reasonable by checking the "Notice on adjusting financial benchmark rate of return of construction projects in some industries" issued by NDRC and the ministry of housing and urban-rural development of PRC on 15/05/2013/48/, which define the financial benchmark of animal industry for Project IRR (after tax) is 9.5% for total investment. The source of the benchmark issued on 15/03/2013/48/ is verified as the latest version after checking the website of NDRC and is verified as available and valid at the time of compiling Project Evaluation Report in 12/2020.

All the input values used in investment analysis are confirmed by VVB as sourced from Project Evaluation Report (PER)/5/, which was completed by an authorized entity in 12/2020, while the project owner signed the General Design and Construction Contract on 03/03/2021/8/ which is the earliest larger expenditure and can be considered as the date for investment decision. Therefore, VVB confirmed that the time interval between the issuance date of the PER and date when the investment decision was made is less than half year, therefore input values are valid and applicable at the time of the investment decision.

Crosscheck of input parameters

The parameters used in the financial calculations have been validated based on a review of the source presented in the Joint-PD-MR, the PER /5/. The PER /5/ of the project activity was completed by a qualified third-party designing institute in 12/2020. The investment decision made by the PP was on 03/03/2021, which is the earliest signing date of the equipment purchase

contract /8/. The time period between the finalization of the PER /5/ (12/2020) and the investment decision (03/03/2021) /8/ is less than 1 year, therefore it's unlikely that the input values have significantly changed.

CTI validation team compared the values stated in the Joint-PD-MR with values determined in the the PER /5/, and was able to confirm that the input values are applied correctly in the Joint-PD-MR.

Item	Unit	Value	Source
Annual organic fertilizers sales	t	5,226.02	PER /5/
Price of organic fertilizers	RMB/t	340	PER /5/
Total static investment	10^4 RMB	278.5	PER /5/
O&M cost	10^4 RMB	159.6	PER /5/
Operation period	Year	15	PER /5/
Emission reduction	tCO_2e	42,657	PER /5/
VCU Price	RMB/ tCO_2e	10	PER /5/
Residual value rate	/	5%	PER /5/
Operation period	year	15	PER /5/

The accuracy and suitability of the input values for the investment analysis were crosschecked as below:

Total Static Investment: 278.5*10^4 RMB

Upon reviewing the Contract for the purchase and installation of equipment /8/, it was confirmed that the total contract amount is 460*10^4 RMB. Therefore, the validation team confirmed that the actual total investment has exceeded 278.5*10^4 RMB. So, CTI validation team was able to confirm that the total static investment in the PER, Joint-PD-MR, and NPV and IRR calculation sheet was reasonable and conservative.

Annual O&M cost: 159.6*10^4 RMB

Upon reviewing the PER /5/, CTI confirmed that the annual O&M costs include maintenance expenses for manure treatment equipment, employee salaries, welfare expenses and pension contributions, electricity charges, as well as other management and operational fees. By checking the 2022 O&M cost breakdown of the AWMS /89/, it is confirmed the actual O&M cost of 2022 has exceeded 180*10^4 RMB. Therefore, CTI confirmed that the value of annual O&M cost used in the investment analysis is reasonable.

Annual organic fertilizers sales: 5,226.02 tons

By reviewing the PER /5/, CTI confirmed that the annual organic fertilizer production 5,226.02 tons is estimated based on the production of swine farm under fully operation conditions. Through the sales records of organic fertilizer from 01/06/2021 to 31/01/2023 /29/, CTI confirmed that the actual sales volume of organic fertilizer only accounts for a small portion of the total production of organic fertilizer, with the majority being freely distributed to local villagers. Therefore, the annual organic fertilizers sales by the project activity is deemed reasonable.

Price of organic fertilizers: 340 RMB/t

The price of organic fertilizer base materials derived from the PER /5/ was determined based on the purchasing prices from nearby farmers and fertilizer base materials processing plants in the survey area. After reviewing the sales agreement for organic fertilizer /28/, CTI confirmed that the organic fertilizer is sold to local agricultural companies and local organic fertilizer factories at a fixed price of 340 yuan/ton, which aligns with the estimated price in the PER /5/. Therefore, CTI validation team considered that the estimated the price of organic fertilizers used for investment analysis is conservative.

Taxes and Residual value rate

Items	Value
VAT	0%
Income tax	0%
Stamp duty rate	0.03%

By reviewing the related regulations /49/-/54/, CTI confirmed that all the taxes and residual value rate used for investment analysis are suitable for this project.

Lifetime: 15 years

The lifetime of the project activity was estimated to be 15 years in the EIA /6/. The lifetime of the project activity has been crosschecked with purchasing contract of main equipment /7/ and the construction contract /9/ in which it mentioned that the guarantee period of the project activity is no less than 15 years. Therefore, CTI validation team was able to confirm that the lifetime estimated in the EIA /6/ is reasonable and the project operation period could cover the 10-year fixed crediting period without affecting the additionality of the project activity.

Conclusion

In conclusion, based on the information validated, the assessment team confirms that all the input values for investment analysis are in reasonable ranges. In addition, the assessment team was able to confirm that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project. Therefore, the assessment team confirms that the assumptions of investment analysis are appropriate and the financial calculations are correct.

Calculation and comparison of financial indicators

CTI validation team compared the values stated in the PD with values determined in the approved EIA /6/ and the research report on operation and maintenance costs and economic benefits /8/ was able to confirm that the input values are applied correctly in the PD.

And by checking the calculation process of the value of IRR in the calculation sheet/3/, CTI confirmed that the value of IRR of the project scenario with carbon revenue is increased to 15.74% which is higher than the benchmark of 9.5% and thus the proposed project is financially acceptable with carbon revenue. A sensitivity analysis has been provided in the JPM and the calculation sheet/3/. The analysis is assessed as follow,

The sensitivity analysis was demonstrated through two manners:

a) Varying ± 10 % of three critical parameters (total static investment, O&M cost and Annual Organic fertilizers sales). The selection is checked as in line with the requirements in Tool of Investment analysis (version 11.0)/59/ of "Only variables, including the total static investment, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation", the Total static investment and Organic fertilizers sales are checked as constitutes more than 20% of total project costs. The total O&M throughout the project lifetime is checked as accounts for more than 20% of the project cost.

Via checking the sensitivity analysis for these three critical parameters as provided in JPM and the calculation sheet/3/, CTI has verified the ± 10% variation in the three key parameters, and confirmed that a 10% increase in annual organic fertilizer sales would result in an IRR exceeding the baseline value.

CTI validated via the IRR calculation table that when the annual organic fertilizer sales volume of organic fertilizer increases by 9.75%, the internal rate of return would reach the baseline value. However, upon reviewing the PER/5/, CTI affirmed that the sales of organic fertilizer is determined by the manure from the swine farm and fertilizer price. Moreover, by examining the pigsty construction contract/12/, the actual stocking data from 01/06/2021 to 31/01/2023/24/, and the on-site visit with the PP, it was confirmed that the stock data of breeding swine and market swine in the PER represent the maximum design capacity of the pigsty. Furthermore, CTI, through the sales records of organic fertilizer from 01/06/2021 to 31/01/2023/29/, confirmed that the actual sales volume of organic fertilizer only accounts for a small portion of the total production of organic fertilizer, with the majority being freely distributed to local villagers. Upon reviewing the sales agreement for organic fertilizer/28/, CTI confirmed that the organic fertilizer is sold to local agricultural companies and local organic fertilizer factories at a fixed price of 340 yuan/ton, which aligns with the estimated price in the PER/5/. Therefore, it is not possible to increase the annual production of organic fertilizer by 9.75% to make the internal rate of return reach the baseline.

b) Threshold analysis by varying the other two parameters to make the IRR reach the benchmark. The threshold analysis of each parameter is assessed individually by the validation team as below,

i. If the Total static investment decreases by 48%, the IRR reach the benchmark, however, via checking the price index of investment in fixed asset for China/78/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the Total static investment reducing by 48% to make the project becomes economical attractive. In

addition, due to the project has been operated during the joint audit process, via checking the Equipment (boilers, solid-liquid separators, flare systems and anaerobic tanks) purchase contracts/8/, CTI confirmed that the actual costs of the main equipment is about 4.6 Million RMB, which is higher than estimated value in PER (2.785 Million RMB)/5/. Therefore, CTI confirmed that the value in PER/5/ is reasonable and conservative.

ii. If the O&M Costs decrease by 10.42%, the IRR reach the benchmark, however, via checking the PER/5/, CTI confirmed that O&M costs mainly consist of maintenance cost, salary & welfare, insurance of fixed assets, and other cost. Via checking the average monthly wage level in Gansu Province/78/, CTI confirmed that the average monthly wage keeps increasing in past years. Besides, via checking the indices of purchasing price of raw material, power and fuel/78/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the O&M cost reducing by 10.42% to make the IRR reach the benchmark.

In conclusion, the investment analysis concludes that the project IRR (after tax) will not reach the benchmark of 9.5% and the project activity is unlikely to be financially attractive. Threshold analysis is further proved this. The sensitivity analysis and threshold analysis was reproduced by the validation team and evaluated to be correct. Based above, it can confirm that the financial unattractiveness of the project is robust and thus the scenario 6 is the most economically attractive option and plausible baseline scenario.

Hence the scenario 6 is considered as baseline scenario which is “The manure is disposed in an uncovered anaerobic lagoon”.

Based on the checking the data provided in Joint-PD-MR and above related assessment, it proves that the baseline scenario determined in the Joint-PD-MR is correct and reasonable. Therefore, baseline scenario is identified transparently for the project activity.

The assessment team has reviewed the Joint-PD-MR in line with the applied methodology and methodological tool and CTI confirmed that PP has correctly identified the baseline scenario.

3.4.5 Additionality

By means of comparison of the Joint-PD-MR with "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/52/, the validation team has assessed the additionality demonstration in accordance with applicable methodology and tool.

Step 1-3 of the tool were already done in section B.4 of this Joint-PD-MR for selection of alternative 6 and 8&17 as assessed in above section 3.3.4.

Then for the demonstration of additionality, the below step is assessed.

Step 4 Common practice analysis

The common practice analysis was checked strictly followed Methodological tool “Common practice” (Version 03.1)/50/.

Step 1: calculate applicable capacity or output range as +/-50% of the design capacity or output of the proposed project activity

The project activity is to treat the manure from the swine farm, and the swine farm involving 41,935 heads of market swine 5,885 heads of breeding swine in stock are included, and are estimated to produce 29,674.5 tons of manure every year. So the range is the projects handle manure from 14,837.25 tons to 44,511.75 tons are considered as similar projects.

Step 2: identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

a) The projects are located in the applicable geographical area,

b) The projects apply the same measure as the proposed project activity,

c) The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity,

d) The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant,

e) The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1,

f) The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

Demonstration as follow,

a) The region selected for common practice of Gansu Province is assessed as appropriate and reasonable. A province is the second administrative level of China after central Government and it is authorized to execute administrative examination and approval for construction projects considering local regulations based on local expertise of the validation team; also by considering differences of economic development level, population size, industrial structure, fundamental infrastructure, strategic planning etc, the investment environment of each province, and unique geological conditions in Gansu Province results in the different resource, thus region selected for common practice is Gansu Province.

b) Same measures is defined as: Methane formation avoidance

c) Same energy source/fuel and feedstock: biogas captured for heat generation and used in Swine Farm,

d) Treat manure waste and produce heat technology,

e) Output range: handle manure from 14,837.25 tons to 44,511.75 tons annually

f) Commercial operation started before 201/06/2021.

Thus, the Swine Farm Animal Manure Management System GHG Mitigation projects operated before 01/06/2021, handle manure from 14,837.25 tons to 44,511.75 tons annually in Gansu province are determined similar projects.

The information source from Development and Reform Commission of Gansu Province/79/ and other public information from Department of Agriculture and Rural affairs of Gansu Province/80/ for the common practice analysis is available and checked by the audit team. The information used is evaluated to be credible.

Via the source, CTI confirmed that there are no similar projects identified in Gansu Province based on the above criteria.

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

There are no similar projects identified in Gansu Province.

Hence $N_{all}=0$.

Step 4: within similar projects identified in Step 3, identify those that are different to the technology applied in the proposed project activity. Note their number Ndiff.

Due to $N_{all}=0$, $N_{all}=N_{diff}=0$.

Step 5: calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

For this project, $F=1- N_{diff}/N_{all} =1-1=0$ and $N_{all}-N_{diff}=0$. It can be concluded that the project is not a common practice. In conclusion, the project meets the criteria and tool “Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)”, thus deemed as additional.

3.4.6 Quantification of GHG Emission Reductions and Removals

For validation of the estimated GHG emission reductions in the Joint-PD-MR/1/ and ER calculation sheet/2/.

Further, the VVB has downloaded from the UNFCCC website the applicable version of the CDM methodology.

Via verify the Joint-PD-MR/1/, it is confirmed the calculation of ERs is done as per the applied methodology (ACM0010 Version 08) with follow steps listed below.

Baseline Emission:

As per the approved consolidated Methodology ACM0010 Version 08, the baseline emissions are calculated by the following equation:

$$BE_y = BE_{CH4,y} + BE_{N2O,y} + BE_{elec/heat,y} \quad \text{Equation 1}$$

Where:

BE_y	Baseline emissions in year y (tCO_2e/yr)
$BE_{CH4,y}$	Baseline CH_4 emissions in year y (t CO2/yr)
$BE_{N2O,y}$	Baseline N_2O emissions in year y (t CO_2/yr)
$BE_{elec/heat,y}$	Baseline CO_2 emissions from electricity and/or heat used in the baseline (t CO_2/yr)

1. Baseline CH_4 emissions ($BE_{CH4,y}$)

$$BE_{CH_4,y} = GWP_{CH_4} \times D_{CH_4} \times \sum_{j,LT} (MCF_j \times B_{0,LT} \times N_{LT} \times VS_{LT,y} \times MS\%_{Bl,j}) \quad \textbf{Equation 2}$$

Where:

$BE_{CH_4,y}$	Baseline CH_4 emissions (t CO_2/yr)
GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/t CH_4)
D_{CH_4}	Density of CH_4 (t/m^3)
MCF_j	Annual methane conversion factor (MCF) for the baseline AWMSj
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m^3CH_4/kg -dm)
N_{LT}	Annual average number of animals of type LT for the year y (number)
$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)
$MS\%_{Bl,j}$	Fraction of manure handled in system j in the baseline

LT	Type of livestock
j	Type of treatment system

Estimation of various variables and parameters for above equation:

(A) $VS_{LT,y}$

As per the methodology, there are four options to determine this value, via checking the options provided, CTI confirmed there is no published country specific data available based on the local expertise of audit team. The energy intake of the swine is not available, Option 2 can't be used. Option 3 utilizes the average weight of the swine, this data is available and therefore Option 3 is adopted by PP to calculate $VS_{LT,y}$.

Scaling default IPCC values $VS_{default}$ to adjust for a site-specific average animal weight as shown in equation below:

$$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}}\right) \times VS_{default} \times nd_y \qquad \textbf{Equation 3}$$

Where:

$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)
W_{site}	Average animal weight of a defined livestock population at the project site (kg)
$W_{default}$	Default average animal weight of a defined population (kg)
$VS_{default}$	Default value for the volatile solid excretion per day on a drymatter basis for a defined livestock population (kg-dm/animal/day)
nd_y	Number of days treatment plant was operational in year y

(B) N_{LT}

As per the methodology, there are four options to determine this value, via checking the options provided, via site inspection, CTI confirmed that there are two types of swine in this project, i.e., Market swine and Breeding swine.And the PP can monitor the daily stock of market and breeding swine in a reliable way, discounting dead breeding swine and discarded them from the productive process from the daily stock. Therefore, it is reasonable to use Option 2 to calculate the N_{LT} of swine.

Option 1:

$$N_{LT} = N_{da,LT} \times \frac{N_{p,LT}}{365} \quad \textbf{Equation 4}$$

Where:

N_{LT}	Annual average number of animals of type LT for the year y (number)
$N_{da,LT}$	Number of days animal of type LT is alive in the farm in the year y (number)
$N_{p,LT}$	Number of animals of type LT produced annually for the year y (number)

Option 2:

$$N_{LT} = \frac{\sum_1^{365} N_{AA,LT}}{365} \quad \textbf{Equation 5}$$

Where:

N_{LT}	Annual average number of animals of type LT for the year y (number)
N_{AA}	Daily stock of animals of type LT in the farm, discounting dead and discarded animals (number)

(C) $B_{0,LT}$

As per the applied methodology, this value varies by species and diet. Default values are used and they are taken from tables 10A-4 through 10A-9 (IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter10)/44/.

CTI verified that the maximum methane producing potential ($B_{0,LT}$) for Market swine and Breeding swine in Asia region is 0.29 m^3 CH_4/kg VS is applicable to the project due to project is located in Gansu Province, China, Asia which is verified by checking the Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter 10/44/.

(D) MCF_j

As per the applied methodology, the MCF_j values given in table 10.17, chapter 10, volume 4, IPCC 2006 Guidelines/39/ should be used. MCF_j values depend on the annual average temperature where the anaerobic manure treatment facility in the baseline existed.

i.For this project, the annual average temperature is confirmed as 13℃/75/ and the value of 71% applied is verified as consistent with IPCC/44/.

ii.A conservativeness factor should be applied by multiplying MCF_j values (estimated as per above bullet) with a value of 0.94, to account for the 20% uncertainty in the MCF_j values as reported by IPCC 2006/44/.

2. Baseline N_2O emissions $BE_{N2O,y}$

$$BE_{N_2O,y} = GWP_{N_2O} \times CF_{N_2O-N,N} \times \frac{1}{1000} \times (E_{N_2O,D,y} + E_{N_2O,ID,y}) \quad \textbf{Equation 6}$$

$$E_{N_2O,D,y} = \sum_{j,LT} EF_{N_2O,D,j} \times NEX_{LT,y} \times N_{LT} \times MS\%_{Bl,j} \quad \textbf{Equation 7}$$

$$E_{N_2O,ID,y} = \sum_{j,LT} EF_{N2O,ID} \times F_{gasMS,j,LT} \times NEX_{LT,y} \times N_{LT} \times MS\%_{Bl,j} \quad \textbf{Equation 8}$$

Where:

$BE_{N_2O,y}$	Annual baseline N_2O emissions in (t CO_2e/yr)
GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$E_{N_2O,D,y}$	Direct N_2O emissions in year y (kg N_2O-N/year)
$E_{N_2O,ID,y}$	Indirect N_2O emissions in year y (kg N2O-N/year)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)
$EF_{N_2O,D,j}$	Direct N_2O emission factor for the treatment system j of the manure management system (kg N_2O-N/kg N)
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation (5(a)) or (5(b)) (number)
$MS\%_{Bl,j}$	Fraction of manure handled in system j (fraction)
$EF_{N2O,ID}$	Indirect N_2O emission factor for N_2O emissions from atmospheric deposition of nitrogen on soils and water surfaces (kgN_2O-N/kg NH_3-N and NO_X-N)
$F_{gasMS,j,LT}$	Default values for nitrogen loss due to volatilisation of NH3 and NOX from manure management (fraction)

Estimation of various variables and parameters for above equations:

(A) $NEX_{LT,y}$

As outlined in Appendix 2 of the applied methodology, two options are provided. For this project, after reviewing related national standards /104/ and other public information, CTI confirmed that

neither specific information on the portion of nitrogen intake nor site-specific national or regional data is available. Consequently, Option 2 has been adopted for calculating $NEX_{LT,y}$.

Option 2:

In the absence of availability of project specific information on protein intake, which should be justified in the Joint-PD-MR, national or regional data should be used for the nitrogen excretion $NEX_{LT,y}$, if available. In the absence of such data, default values from table 10.19 of the IPCC 2006, volume 4, chapter 10) may be used and should be corrected for the animal weight at the project site in the following way:

$$NEX_{LT,y} = \frac{W_{site}}{W_{default}} \times NEX_{IPCC,default} \quad \textbf{Equation 9}$$

Where:

NEX_{site}	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr)
W_{site}	Average animal weight of a defined livestock population at the project site (kg)
$W_{default}$	Default average animal weight of a defined population (kg)
$NEX_{IPCC,default}$	Default value for the nitrogen excretion per head of a defined livestock population (kg N/animal/year)

Via checking the IPCC, it is confirmed that below equation is used for calculate $NEX_{IPCC\ default}$

$$NEX_{IPCC,default} = N_{rete(T)} \times \frac{TAM}{1000} \times 365 \quad \textbf{Equation 10}$$

Where:

$N_{rete(T)}$	the default N excretion rate, kg N/ (1,000 kg animal mass)/ day, table 10.19, chapter 10, volume 4 of IPCC 2006 Guidelines
TAM	Typical animal mass for livestock in kg/animal

3. Baseline CO_2 emissions from electricity and/or heat used in the baseline

$$BE_{elec/heat,y} = BE_{EC,y} + BE_{HG,y} \quad \textbf{Equation 11}$$

Where:

$BE_{elec/heat,y}$	Baseline CO_2 emissions from electricity and/or heat used in the baseline (t CO_2/yr)
$BE_{EC,y}$	Baseline emissions associated with electricity generation in year *y* (t CO_2/yr)
$BE_{HG,y}$	Baseline emissions associated with heat generation in year *y* (t CO_2/yr)

Through site inspection and checking of baseline scenario evidence/31/, CTI confirmed that the baseline scenario for this project is an uncovered anaerobic lagoon with no heat or electricity used in the baseline. In addition, the biogas generated during the treatment process of this project will be collected for heat production and used by AWMS and the swine farm. The heat generated will not be connected to other users nor will it be used to generate electricity for feed-in to the grid. Therefore, the CO_2 emissions of the electricity and/or heat used in the baseline are 0, which is conservative.

Project emission:

Based on the applied methodology, and via site inspection checking the project implementation, CTI confirmed that there are two stages involved in the manure treatment for the project activity: (1) anaerobic digester; (2) aerobic composting.

The Project emissions are estimated as follows:

$$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{N_2O,y} + PE_{EC/FC,y} \quad \textbf{Equation 12}$$

Where:

PE_y	Project emissions in year y
$PE_{AD,y}$	Project emissions associated with the anaerobic digester in year y (t CO_2e/yr)
$PE_{Aer,y}$	Project CH_4 emissions from aerobic AWMS treatment (t CO_2e/yr)
$PE_{N20,y}$	Project N_2O emissions in year y (t CO_2/yr)
$PE_{EC/FC,y}$	Project emissions from electricity consumption and fossil fuel combustion (t CO_2e/yr)

1. Project emissions associated with the anaerobic digester ($PE_{AD,y}$)

$PE_{AD,y}$ is determined using the methodological tool "Project and leakage emissions from anaerobic digesters" (Version 02.0) as defined in the applied methodology, as per the tool

$$PE_{AD,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{flare,y}$$ **Equation 13**

Where:

$PE_{AD,y}$	Project emissions associated with the anaerobic digester in year y (t CO_2e)
$PE_{EC,y}$	Project emissions from electricity consumption associated with the anaerobic digester in year y (t CO_2e)
$PE_{FC,y}$	Project emissions from fossil fuel consumption associated with the anaerobic digester in year y (t CO_2e)
$PE_{CH4,y}$	Project emissions of methane from the anaerobic digester in year y (t CO_2e)
$PE_{flare,y}$	Project emissions from flaring of biogas in year y (t CO_2e)

1.1 $PE_{EC,y}$

During the site review and visit with the PP, it was confirmed that the power consumption associated with anaerobic digestion was not separately monitored for this project. Therefore, all emissions resulting from power consumption for this project were calculated using the subsequent equation.

The project emissions from electricity consumption is calculated according to the "Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0).

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \times EF_{EF,j,y} \times (1 + TDL_{j,y})$$ **Equation 14**

Where:

$PE_{EC,y}$	Project emissions from electricity consumption in year y (t CO_2e)
$EC_{PJ,j,y}$	The total electricity consumption associated with the anaerobic digestion facilityin year y (MWh/yr)
$EF_{EF,j,y}$	Emission factor for electricity generation for source j in year y (t CO2/MWh)
$TDL_{j,y}$	Average technical transmission and distribution losses for providing electricity to source j in year y

Upon examining the ER sheet for ex-ante estimation/2/ and the PER/5/, CTI confirmed that the EC value in the ex-ante calculation was sourced from the PER. By comparing this with the actual

power of the main equipment detailed in the technical service contract, CTI validated the reasonableness of the EC value used in the ex-ante calculation. This parameter is monitored by the electricity meter during actual operation, as detailed in Section 4.1.

1.1.1 $EF_{EF,j,y}$

As per Tool 05 Version03.0, the Combined margin CO_2 emission factor for grid connected power generation in year y ($EF_{EF,j,y}=EF_{grid,CM,y}$) is calculated in a transparent and conservative manner as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the steps prescribed in the "Tool to calculate the emission factor for an electricity system", version 07.0.

The Joint-PD-MR (Version 02 dated 30/04/2023) applies the calculation of the grid emission factor as per the latest available official guidance "2019 Baseline Emission Factors for Regional Power Grids in China" published by the DNA of China based on the data from China Electric Power Yearbook (2016~2018) and China Energy Statistical Yearbook (2016~2018). $EF_{grid,OMsimple,y}$ is calculated to be 0.8922 tCO_2e/MWh and $EF_{grid,BM,y}$ is calculated to be 0.4407 tCO_2e/MWh. The validation team has checked the website of China's DNA (Designated National Authority)/73/ and can confirm the most recent data available at the time of submission of crediting renew request is applied in the Joint-PD-MR. It is confirmed that the calculation is in accordance with the calculation process of the corresponding methodology and tools.

As per the "Tool to calculate the emission factor for an electricity system" (version 07.0)/54/ and based on the weight ω_{OM} and ω_{BM} of 0.5:0.5 by default for the first crediting period, the combined margin emission factor $EF_{EF,j,y}$= 0.66645 t CO_2/MWh. This value is fixed ex-ante for the crediting period.

1.2 $PE_{FC,y}$

Via site inspection, CTI confirmed that there are no fossil fuels involved in the project for anaerobic digestion process, hence $PE_{FC,y}=0$.

1.3 $PE_{flare,y}$

Via site inspection, it is confirmed that the residual gas stream will be flared by flaring, so the project emissions from flaring of biogas ($PE_{flare,y}$) shall be estimated using the tool 06 "Project emissions from flaring" (version 04.0)/54/

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

The calculation procedure of project emissions from flaring is given in the following steps:

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

STEP 2: Determination of the flare efficiency;

STEP 3: Calculation of project emissions from flaring.

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

The tool 08 “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” shall be used to determine the following parameter $F_{CH4,m}$:

The following requirements apply:

(a) The gaseous stream to which the tool is applied is the residual biogas for flaring;

(b) The flow of the gaseous stream shall be measured continuously;

(c) CH_4 is the greenhouse gas i for which the mass flow should be determined;

(d) The simplification offered for calculating the molecular mass of the gaseous stream is valid (equations 3 and 17 in the tool); and

(e) The time interval t for which mass flow should be calculated is every minute m.

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

Through the PER/5/ and the technical agreement of the anaerobic digester/14/, CTI confirmed that the reaction temperature of the anaerobic digester ranges between 32-38℃. Further, during a site inspection and interview with the PP, it was confirmed that the biogas is not warmed before being delivered to the flare for combustion. In actual operation, the temperature of the gas delivered to the flare is monitored by Flow Meter 3, installed at the flare's inlet. Thus CTI confirmed that the temperature of the gaseous stream at the monitoring point will not exceed 60℃, meeting the requirements of Tool08 and making Option A applicable. The mass flow rate of methane in the residual gas is calculated by the following equation：

$$F_{i,t} = V_{t,db} \times v_{i,t,db} \times \rho_{i,t} \qquad \textbf{Equation 15}$$

$$\rho_{i,t} = \frac{P_t \times MM_i}{R_u \times T_t} \qquad \textbf{Equation 16}$$

Where:

$F_{i,t}$	Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)
$V_{t,db}$	Volumetric flow of the gaseous stream in time interval t on a dry basis (m³ dry

gas/h)

$v_{i,t,db}$	Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m³ gas i/m³ dry gas)
$\rho_{i,t}$	Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m³ gas i)
P_t	Absolute pressure of the gaseous stream in time interval t (Pa)
MM_i	Molecular mass of greenhouse gas i (kg/kmol)
R_u	Universal ideal gases constant (Pa.m3/kmol.K)
T_t	Temperature of the gaseous stream in time interval t (K)

Step 2: Determination of flare efficiency

Via site inspection, CTI confirmed that the open flares are applied.

According to tool 06 paragraph 18: in the case of open flares, the flare efficiency in the minute m ($\eta_{flare,m}$) is 50% when the flame is detected in the minute m ($Flame_m$), otherwise $\eta_{flare,m}$ is 0%. Since the flame is not detected in the minute. Moreover, CTI has confirmed through onsite visits and discussions with the PP that all biogas is used for boiler combustion, providing heat for the swine farm and the operation of the AWMS. The installation of the flare is merely a precautionary measure for emergencies, therefore no flame monitoring devices have been installed at the project site. Therefore, fixed value of 0% for the flare efficiency will be applied for this project, and this is for conservative.

Step 3: Calculation of project emissions from flaring

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

$$PE_{flare,y} = GWP_{CH4,y} \times \sum_{m=1}^{525600} F_{CH4,GR,m} \times (1 - \eta_{flare,m}) \times 10^{-3} \quad \textbf{Equation 17}$$

Where:

$PE_{flare,y}$	Project emissions from flaring of the residual gas in year y (tCO_2e)
$GWP_{CH4,y}$	Global warming potential of methane valid for the commitment period (tCO_2e/tCH_4)
$F_{CH4,GR,m}$	Mass flow of methane in the residual gas in the minute m (kg)

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

$F_{CH4,RG,m}$ will be determined as above assessment. So the Project emissions from flaring can be calculated by:

$$PE_{flare,y} = GWP_{CH4,y} \times V_{t,db} \times v_{i,t,db} \times \rho_{i,t} \times (1 - \eta_{flare,m}) \times 10^{-3} \quad \textbf{Equation 18}$$

Where:

$V_{t,db}$ Volumetric flow of the gaseous stream in time interval t on a dry basis (m³ dry gas/h)

$v_{i,t,db}$ Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m³ gas i/m³ dry gas)

$\rho_{i,t}$ Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m³ gas i)

Through the PER/5/, site inspection, and site visit with the PP, CTI confirmed the presence of biogas storage tanks on the project site. It was also confirmed that all biogas produced from the anaerobic digestion tanks is used to provide heat for the swine farm and AWMS operations through the biogas boiler. Biogas is only flared by the flare in case of emergencies. As such, CTI affirms the reasonableness of assuming a value of 0 for the methane burned by the flare in the ex-ante calculation. The actual emission reduction calculation will use data monitored by Flow Meter 3, as detailed in sections 3.4.8 and 4.1.

1.4 $PE_{CH4,y}$

The project emissions from methane from the anaerobic digester is calculated according to the tool "Project and leakage emissions from anaerobic digesters (Version 02.0)"/57/. According to the tool, Project emissions of methane from the anaerobic digester include emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester.

These emissions are calculated using a default emission factor ($EF_{CH4,default}$), as follows:

$$PE_{CH4,y} = Q_{CH4,y} \times EF_{CH4,default} \times GWP_{CH4} \quad \textbf{Equation 19}$$

Where:

$PE_{EC,y}$ Project emissions of methane from the anaerobic digester in year y (t CO_2e)

$Q_{CH4,y}$ Quantity of methane produced in the anaerobic digester in year y (t CH_4)

$EF_{CH4,default}$ Default emission factor for the fraction of CH_4 produced that leaks from the

anaerobic digester (fraction)

GWP_{CH4} Global warming potential of CH_4 (t CO_2 / t CH_4)

1.4.1 $Q_{CH4,y}$

The estimated annual emission reduction for this project is less than 60,000 tCO_2e, but CTI confirmed through site inspections and site interviews with PP that the project has installed flow meters and gas analyzers as monitoring equipment, so it is reasonable to choose Option 1 of Tool14 to confirm the methane production.

Option1: Procedure using monitored data $Q_{CH4,y}$ shall be measured using the "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)/56/. When applying the tool, the following applies:

a. The gaseous stream to which the tool is applied is the biogas collected from the digester;

b. CH_4 is the greenhouse gas i for which the mass flow should be determined; and

c. The flow of the gaseous stream should be measured on an hourly basis or a smaller time interval; and then accumulated for the year y. Please note that units need to be converted to tons, when applying the results in this tool.

The biogas is produced and collected from anaerobic digestion process. The flowmeters are installed at the outlet of the biogas digesters and the measured on an hourly basis time interval. So the quantity of methane produced in the digester in year y ($Q_{CH4,y}$) is the accumulation of the mass flow of methane in the gaseous stream in an hourly basis time interval. i.e.,$Q_{CH4,y} = \sum_{i=1}^{8760} F_{i,t}$

Similar to the confirmation process for the temperature of the gaseous stream at the monitoring point where Flow Meter 3 is located above, CTI also verified that the biogas produced from the anaerobic digestion tank is first dewatered and desulfurized before being stored and then used in the biogas boiler. This was confirmed by reviewing the EIA report/6/ and through site inspections and visits with the project participant (PP). Therefore, CTI confirms that the temperature of the gaseous stream at the monitoring point where Flow Meter 1 is located is below 60℃. It is thus reasonable for the PP to use Option A in Tool08 for calculating the total methane mass flow rate.

As per the tool, the mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} \times \upsilon_{i,t,db} \times \rho_{i,t} \quad \textbf{Equation 20}$$

$$\rho_{i,t} = \frac{P_t \times MM_i}{R_u \times T_t} \quad \textbf{Equation 21}$$

Where:

$F_{i,t}$ Mass flow of greenhouse gas i in the gaseous stream in time interval t (kg gas/h)

$V_{t,db}$	Volumetric flow of the gaseous stream in time interval t on a dry basis (m³ dry gas/h)
$\upsilon_{i,t,db}$	Volumetric fraction of greenhouse gas i in the gaseous stream in a time interval t on a dry basis (m³ gas i/m³ dry gas)
$\rho_{i,t}$	Density of greenhouse gas i in the gaseous stream in time interval t (kg gas i/m³ gas i)
P_t	Absolute pressure of the gaseous stream in time interval t (Pa)
MM_i	Molecular mass of greenhouse gas i (kg/kmol)
R_u	Universal ideal gases constant (Pa.m3/kmol.K)
T_t	Temperature of the gaseous stream in time interval t (K)

In summary, the Project emissions associated with the anaerobic digester in year y (tCO_2e) is the sum of Project emissions from electricity consumption, project emissions from flaring of biogas (if any), and Project emissions of methane from the anaerobic digester in year y (tCO_2e). i.e., $PE_{AD,y} = PE_{EC,y} + PE_{CH4,y}$.

2. Project CH_4 emissions from aerobic AWMS treatment ($PE_{Aer,y}$)

$$PE_{Aer,y} = GWP_{CH_4} \times D_{CH_4} \times 0.001 \times F_{Aer} \times [\sum_{n=1}^{N}(1 - R_{VS,n})] \times \sum_{j,LT}(B_{0,LT} \times N_{LT} \times VS_{LT,y} \times MS\%_j) + PE_{sl,y} \quad \textbf{Equation 22}$$

Where:

GWP_{CH_4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/tCH_4)
$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to waste being treated (fraction)
D_{CH_4}	Density of CH_4 (t/m^3)
F_{Aer}	Fraction of volatile solid directed to aerobic system (fraction)
LT	Type of livestock
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m^3CH_4/kg dm)
$VS_{LT,y}$	Annual volatile solid excretion livestock type LT entering all AWMS on a dry matter weight basis in (kg -dm/animal/yr)

N_{LT}	Annual average number of animals of type LT for the year y (number) as estimated in equation (5(a)) or (5(b))
$PE_{sl,y}$	Project CH_4 emissions from sludge disposed of in storage pit prior to disposal during the year y (t CO_2e/yr)
$MS\%_j$	Fraction of manure handled in system j in the project activity (fraction)

CTI confirmed through the EIA report, site inspections, and on-site interviews with the project participant (PP) that the animal manure processed in the project undergoes homogenization before aerobic composting. As such, 'N' in the above equation is 1, and '$R_{VS,1}$' represents the treatment efficiency of volatile solid in the homogenization stage. The confirmation process for the value of $R_{VS,1}$ is detailed in Section 3.4.8. Additionally, after the homogenization stage, solids and liquids are subjected to solid-liquid separation. Following this, the solids are directed to the aerobic composting plant, while the liquids proceed to the anaerobic digestion tank. Given this, CTI considers it conservative to assign a value of 100% to $MS\%_j$ in the above equation.

All sludge produced from the aerobic composting will be used for land application, which is calculated as leakage emission, so the $PE_{sl,y}$=0.

3. Project N_2O emissions in year y ($PE_{N2O,y}$)

$$PE_{N_2O,y} = GWP_{N_2O} \times CF_{N_2O-N,N} \times \frac{1}{1000} \times (E_{N_2O,D,y} + E_{N_2O,ID,y}) \quad \textbf{Equation 23}$$

Where:

$PE_{N_2O,y}$	Project N_2O emissions in year y (t CO_2/yr)
GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)
$E_{N_2O,D,y}$	Direct N_2O emission in year y (kg N_2O-N/year)
$E_{N_2O,ID,y}$	Indirect N_2O emission in year y (kg N_2O-N/year)

The same method used to estimate the emissions in the baseline should be used to estimate the project emissions of nitrous oxide, so the Option 1 is used to calculate the Project N_2O emissions $PE_{N2O,y}$.

$$E_{N_2O,D,y} = EF_{N2O,D,1} \times NEX_{LT,y} \times N_{LT} \times MS\%_1 + (1 - R_{N,1}) \times EF_{N2O,D,2} \times NEX_{LT,y} \times N_{LT} \times MS\%_2 + (1 - R_{N,1}) \times EF_{N2O,D,3} \times NEX_{LT,y} \times N_{LT} \times MS\%_3 \quad \textbf{Equation 24}$$

$$E_{N_2O,ID,y} = EF_{N2O,ID} \times F_{gasMS,1,LT} \times NEX_{LT,y} \times N_{LT} \times MS\%_1 + (1 - R_{N,1}) \times EF_{N2O,ID} \times F_{gasMS,2,LT} \times NEX_{LT,y} \times N_{LT} \times MS\%_2 + (1 - R_{N,1}) \times EF_{N2O,ID} \times F_{gasMS,3,LT} \times NEX_{LT,y} \times N_{LT} \times MS\%_3$$ **Equation 25**

Where:

$E_{N_2O,D,y}$	Direct N_2O emission in year y (kg N_2O-N/yr)
$E_{N_2O,ID,y}$	Indirect N_2O emission in year y (kg N_2O-N/year)
$EF_{N2O,D,j}$	Direct N_2O emission factor for the treatment system j of the manure management system (kg N_2O-N/kg N). For homogenization, aerobic composting and anaerobic digestion in this project, j takes the values of 1, 2, and 3, respectively
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2
N_{LT}	Annual Average number of animals of type LT for the year y estimated as per equation 4 and 5 (number)
$MS\%_j$	Fraction of manure handled in system j (fraction)
$EF_{N_2O,ID}$	Indirect N_2O emission factor for N_2O emissions from atmospheric deposition of nitrogen on soils and water surfaces (kgN_2O-N/kg NH_3-N and NO_X-N)
$F_{gasMS,j,LT}$	Default values for nitrogen loss due to volatilisation of NH_3 and NO_X from manure management (fraction). For homogenization, aerobic composting and anaerobic digestion in this project, j takes the values of 1, 2, and 3, respectively
$R_{N,n}$	Nitrogen reduction factor. For homogenization in this project, n equals 1

In the ex-ante calculations, the values for $MS\%_1$, $MS\%_2$, and $MS\%_3$ in equations 24 and 25 are respectively taken as 100%, 50%, and 50%. CTI has confirmed through the PER/5/ that 50% is derived from the estimated separation efficiency of the solid-liquid separation equipment stated in the PER/5/. In actual operation, as there is no monitoring equipment installed at the project site to measure the volume to be treated separately entering the anaerobic digester and the aerobic composting workshop, PP assigned a value of 100% for both parameters in the actual emission reduction calculation process.

Similar to the confirmation process of the above treatment procedures, CTI has confirmed that the manure undergoes homogenization treatment before entering the anaerobic digestion and aerobic composting stages. The confirmation process for the value of $R_{N,1}$ is detailed in Section 3.4.8. CTI has also confirmed the solid-liquid separation equipment taken from the PER/5/ is reasonable by reviewing the EIA/6/ and the technical agreement for the solid-liquid separation equipment. Thus,

it confirms that the values of $MS\%_j$ in the ex-ante calculations are reasonable, and the values of $MS\%_j$ in the actual calculations are conservative.

4. Project emissions from use of heat and/or electricity ($PE_{elec/heat}$)

$$PE_{EC/FC,y} = PE_{EC,y} + \sum_j PE_{FC,j,y} \quad \textbf{Equation 26}$$

Where:

$PE_{EC,y}$ Project emissions from electricity consumption in year y. The project emissions from electricity consumption will be calculated following the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". In case, the electricity consumption is not measured then the electricity consumption shall be estimated as follows $EC_{PJ,y} = \sum_i CP_{i,y} \times 8760$, where $CP_{i,y}$ is the rated capacity (in MW) of electrical equipment i used for the project activity

$PE_{FC,j,y}$ Project emissions from fossil fuel combustion in process j during the year y. The project emissions from fossil fuel combustion will be calculated following the latest version of the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". For this purpose, the processes j in the tool corresponds to all fossil fuel combustion in the AWMS (not including fossil fuels consumed for transportation of feed material and sludge or any other on-site transportation)

Via site inspection, CTI confirmed there is no consumption of heat related to the anaerobic digester. Hence, these emissions should not be considered.

Besides, as described in above, since the electricity consumption that is not related to the anaerobic digester cannot be separated from the total electricity consumption, therefore the emission for consumption of electricity is calculated in $PE_{EC,y}$.

After reviewing the PER /5/ and EIA /6/, conducting onsite inspections, and interviewing with local officials, CTI confirms that the local electricity supply is reliable, with infrequent power outages that do not last long. The project's primary equipment — the anaerobic digestion tanks — will not be affected by these brief power interruptions. Therefore, no equipment that consumes fossil fuels, such as diesel generators, has been installed at the project site.

Therefore, $PE_{elec/heat}$ （$PE_{EC/FC,y}$）=0

Leakage

As per the applied methodology, Leakage covers the emissions from land application of treated manure as well as the emissions related to anaerobic digestion in a digester, occurring outside the

project boundary. These emissions are estimated as net of those released under project activity and those released in the baseline scenario. Net leakage is only considered if they are positive.

$$LE_y = (LE_{PJ,N2O,y} - LE_{BL,N2O,y}) + (LE_{PJ,CH4,y} - LE_{BL,CH4,y}) + LE_{AD,y} \quad \textbf{Equation 27}$$

Where:

$LE_{PJ,N2O,y}$	Leakage N_2O emissions released during project activity from land application of the treated manure in year y (t CO_2e/yr)
$LE_{BL,N2O,y}$	Leakage N2O emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)
$LE_{PJ,CH4,y}$	Leakage CH_4 emissions released during project activity from land application of the treated manure in year y (t CO_2e/yr)
$LE_{BL,CH4,y}$	Leakage CH_4 emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)
$LE_{AD,y}$	Leakage emissions associated with the anaerobic digester in year y (t CO_2e)

1. Estimation of leakage N_2O emissions released during baseline scenario from land application of the treated manure in year y ($LE_{BL,N2O,y}$)

$$LE_{BL,N2O,y} = GWP_{N_2O} \times CF_{N_2O-N,N} \times \frac{1}{1000} \times (LE_{N_2O,land,y} + LE_{N_2O,runoff,y} + LE_{N_2O,vol,y}) \quad \textbf{Equation 28}$$

$$LE_{N_2O,land,y} = EF_1 \times \prod_{n=1}^{N} (1 - R_{N,n}) \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 29}$$

$$LE_{N_2O,runoff,y} = EF_5 \times F_{leach} \times \prod_{n=1}^{N} (1 - R_{N,n}) \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 30}$$

$$LE_{N_2O,vol,y} = EF_4 \times \prod_{n=1}^{N} (1 - R_{N,n}) \times F_{gasm} \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 31}$$

Where:

GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)
$LE_{N_2O,land,y}$	Leakage N_2O emissions from application of manure waste in year y (kg N_2O-N/year)
$LE_{N_2O,runoff,y}$	Leakage N_2O emissions due to leaching and run-off in year y (kg N_2O-N/year)

$LE_{N_2O,vol,y}$	Leakage N_2O emissions due to volatilisation in year y (kg N_2O-N/year)
EF_1	Emission factor for N_2O emissions from N inputs (kg N_2O-N/kg N input)
EF_5	Emission factor for N_2O emissions from N leaching and runoff in (kg N_2O-N/kg N leached and runoff)
EF_4	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces, [kg N- N_2O/ (kg NH_3-N + NO_X-N volatilized)]
F_{leach}	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff (fraction)
F_{gasm}	Fraction of N lost due to volatilization (fraction)
$R_{N,n}$	Nitrogen reduction factor (fraction). For uncovered anaerobic lagoon in baseline, n equals 0
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2
N_{LT}	Annual average number of animals of type LT estimated as per equation 4 and 5 (number)

2. Estimation of leakage N_2O emissions released during project activity from land application of the treated manure in year y ($LE_{PJ, N2O}$)

$$LE_{PJ,N2O,y} = GWP_{N_2O} \times CF_{N_2O-N,N} \times \frac{1}{1000} \times (LE_{N_2O,land,y} + LE_{N_2O,runoff,y} + LE_{N_2O,vol,y}) \quad \textbf{Equation 32}$$

$$LE_{N_2O,land,y} = EF_1 \times \prod_{n=1}^{N} (1 - R_{N,n}) \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 33}$$

$$LE_{N_2O,runoff,y} = EF_5 \times F_{leach} \times \prod_{n=1}^{N} (1 - R_{N,n}) \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 34}$$

$$LE_{N_2O,vol,y} = EF_4 \times \prod_{n=1}^{N} (1 - R_{N,n}) \times F_{gasm} \times \sum_{LT} NEX_{LT,y} \times N_{LT} \quad \textbf{Equation 35}$$

Where:

GWP_{N_2O}	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N_2O-N,N}$	Conversion factor N_2O-N to N_2O (44/28)

$LE_{N_2O,land,y}$	Leakage N_2O emissions from application of manure waste in year y (kg N_2O-N/year)
$LE_{N_2O,runoff,y}$	Leakage N_2O emissions due to leaching and run-off in year y (kg N_2O-N/year)
$LE_{N_2O,vol,y}$	Leakage N_2O emissions due to volatilisation in year y (kg N_2O-N/year)
EF_1	Emission factor for N_2O emissions from N inputs (kg N_2O-N/kg N input)
EF_5	Emission factor for N_2O emissions from N leaching and runoff in (kg N_2O-N/kg N leached and runoff)
EF_4	Emission factor for N_2O emissions from atmospheric deposition of N on soils and water surfaces, [kg N- N_2O/ (kg NH_3-N + NO_X-N volatilized)]
F_{leach}	Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff (fraction)
F_{gasm}	Fraction of N lost due to volatilization (fraction)
$R_{N,n}$	Nitrogen reduction factor (fraction). For homogenization, and anaerobic-aerobic combined treatment in the project, n takes the values of 1 and 2, respectively.
$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2
N_{LT}	Annual average number of animals of type LT estimated as per equation 4 and 5 (number)

3. Estimation of leakage CH_4 emissions from land application of the treated manure

The calculation of methane emissions from land application of manure in the baseline and project cases are estimated as below:

$$LE_{BL,CH4,y} = GWP_{CH4} \times D_{CH4} \times MCF_d \times [\prod_{n=1}^{N}(1 - R_{VS,n})] \times \sum_{j,LT}(B_{0,LT} \times N_{LT} \times VS_{LT,y} \times MS\%_j) \quad \textbf{Equation 36}$$

$$LE_{PJ,CH4,y} = GWP_{CH4} \times D_{CH4} \times MCF_d \times [\prod_{n=1}^{N}(1 - R_{VS,n})] \times \sum_{j,LT}(B_{0,LT} \times N_{LT} \times VS_{LT,y} \times MS\%_j) \quad \textbf{Equation 37}$$

Where:

$LE_{BL,CH4,y}$	Leakage CH_4 emissions released during baseline scenario from land application of the treated manure in year y (t CO_2e/yr)

$LE_{PJ,CH4,y}$	Leakage CH_4 emissions released during project activity from land application of the treated manure in year y (t CO_2e/yr)
$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to sludge being treated. For uncovered anaerobic lagoon in baseline, n equals 0; for homogenization, and anaerobic-aerobic combined treatment in the project, n takes the values of 1 and 2, respectively.
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (t CO_2e/tCH_4)
D_{CH4}	Density of CH_4 (t/m^3)
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated by animal type LT (m3CH_4/kg dm)
N_{LT}	Annual average number of animals of type LT estimated as per equation 4 and 5, expressed (number)
$VS_{LT,y}$	Annual volatile solid excretions for livestock LT entering all AWMS on a dry matter weight basis (kg -dm/animal/yr)
$MS\%_j$	Fraction of manure handled in system j in the project activity (fraction)
MCF_d	Methane conversion factor (MCFd) assumed to be equal to 1

4. Estimation of leakage emissions associated with the anaerobic digester

$LE_{AD,y}$ is determined using the methodological tool “Project and leakage emissions from anaerobic digesters” (Version 02.0)/57/.

The leakage emissions associated with the anaerobic digester ($LE_{AD,y}$) depend on how the digestate is managed. They include emissions associated with storage and composting of the digestate and are determined as follows:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y} \quad \textbf{Equation 38}$$

Where:

$LE_{AD,y}$	Leakage emissions associated with the anaerobic digester in year y (t CO_2e)
$LE_{storage,y}$	Leakage emissions associated with storage of digestate in year y (t CO_2e)
$LE_{comp,y}$	Leakage emissions associated with composting digestate in year y (t CO_2e)

The anaerobic digestion process of this project is carried out in a fully enclosed system. All biogas produced during the treatment process will be used to produce heat for the farm and AWMS. After

anaerobic digestion, the fermented sludge is treated in aerobic composting system and organic fertilizer can be produced. Wastewater from the new animal waste management systems will be treated aerobically and then used for agriculture irrigation. CTI confirmed the above treatment details by reviewing the PER/5/, the EIA report/6/, site inspections and on-site interviews with PP. So, the Estimation of leakage emissions associated with the anaerobic digester is 0. i.e., $LE_{AD,y}$ =0.

Emission reductions

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{Equation 39}$$

Where:

ER_y	Emission reductions in year y (t CO_2e/yr)
BE_y	Baseline emissions in year y (t CO_2e/yr)
PE_y	Project emissions in year y (t CO_2/yr)
LE_y	Leakage emissions in year y (t CO_2/yr)

Ex ante calculation of emission reductions

Baseline Emission

For Baseline Emission calculation, as per the equation as below

$$BE_y=BE_{CH4,y}+BE_{N2O,y}$$

Based on above assessment, the ex ante baseline emissions can be calculated as follows:

Baseline Emissions: $BE_y=BE_{CH4,y}+BE_{N2O,y}$ =54,830 tCO_2e+952 tCO_2e =55,782tCO_2e

All the ex ante determined values for each basic parameter for BE calculation is checked by CTI for both ex ante value for fixed parameters assessment as above and confirmed the ex ante value for monitored parameters as below. The values used for the ex ante baseline emissions calculation in both Joint-PDMR/1/ and ER sheet/2/ is verified as correct.

Project Emission

Based on above assessment, final PEy calculation for the project activity is listed as below

$$PE_y=PE_{AD,y}+PE_{AER,y}+PE_{N20,y}$$

Based on above assessment, the ex ante project emissions can be calculated as follows:

$PE_{AD,y}$= $PE_{EC,y}$+$PE_{CH4,y}$+$PE_{flare,y}$=2,143 tCO_2e+1,516 tCO_2e+0 tCO_2e=3,659 tCO_2e

PEAER,y= 66 tCO_2e

PEN20,y=6,859 tCO_2e

PEy=$PE_{AD,y}$+$PE_{AER,y}$+$PE_{N2O,y}$= 3,659 tCO_2e + 66 tCO_2e +6,859 tCO_2e=10,584 tCO_2e

All the ex ante determined values for each basic parameter for PE calculation is checked by CTI for both ex ante value for fixed parameters assessment as above and confirmed the ex ante value for monitored parameters as below. The values used for the ex ante project emissions calculation in both Joint-PD-MR/1/ and ER sheet/2/ is verified as correct.

Hence, the validation team confirms that the methodology and the above referenced tools have been applied correctly to calculate baseline emissions, project emissions, leakage and net GHG emission reductions and removals.

Leakage

Based on above assessment, final LE_y calculation for the project activity is listed as below

$$LE_y = (LE_{PJ,N2O,y} - LE_{BL,N2O,y}) + (LE_{PJ,CH4,y} - LE_{BL,CH4,y})$$

Based on above assessment, the ex ante leakage emissions can be calculated as follows:

$LE_{PJ,N2O,y}$=2,417 tCO_2e

$LE_{BL,N2O,y}$=678 tCO_2e

$LE_{PJ,CH4,y}$=13,094 tCO_2e

$LE_{BL,CH4,y}$=12,275 tCO_2e

LE_y=($LE_{PJ,N2O,y}$- $LE_{BL,N2O,y}$)+($LE_{PJ,CH4,y}$ - $LE_{BL,CH4,y}$)=

(2,417 tCO_2e-678 tCO_2e) +(13,094 tCO_2e-12,275 tCO_2e) =2,558 tCO_2e

All the ex ante determined values for each basic parameter for LE calculation is checked by CTI for both ex ante value for fixed parameters assessment as above and confirmed the ex ante value for monitored parameters as below. The values used for the ex ante Leakage emissions calculation in both Joint-PD-MR/1/ and ER sheet/2/ is verified as correct.

Emission reductions

$$ER_y = BE_y - PE_y - LE_y$$

Based on the above assessment of the ex ante determined values, it is verified that the annual ex ante determined ERs calculated result is 42,657 tCO_2/yr.

The detail of emission reduction calculation is transparently discussed in the Joint-PD-MR/1/. The assessment team has checked the Joint-PD-MR/1/ and ER sheet/2/ for the detail calculation of all the particulars and found it to be correct.

In conclusion, based on above values for each parameter for determine the ex-ante of emission reduction calculation, the CTI verified that results in Joint-PD-MR are correct for the ex-ante ER values during the first 7 years crediting period.

The ER calculation sheet/2/ has been duly checked. Further it has been checked whether the results have been correctly calculated in Joint-PD-MR/1/ for determination of ex-ante ER. The VVB has further checked the Joint-PD-MR/1/ against the latest version of the applicable methodology for consistency.

3.4.7 Methodology Deviations

The validation process has assessed all factors and issues that constitute the basis for emission reductions from the project according to the applicable CDM methodology ACM0010 (Version 08) /69/. There was not any methodology deviation applied to this project.

3.4.8 Monitoring Plan

1. Date and parameters available at validation

Please refer to the following tables for assessment of each parameter determined ex-ante only used to calculate the ex-ante emission reduction:

GWP_{CH4}	Global Warming Potential of CH_4
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC Sixth Assessment Report (AR6)
Correct value provided?	Yes –27.9 tCO_2e/tCH_4 Derived from IPCC Sixth Assessment Report (AR6)/46/
Has this value been verified?	Confirmed as correct for ex ante determination. Via checking the 100-year values are adopted from Chapter 7, Table 7.SM.7, IPCC Sixth Assessment Report (AR6)/46/ and VCS Standard Version 4.4/64/, it is verified that the value is correct.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

GWP_{N2O}	*Global Warming Potential of N_2O*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC Sixth Assessment Report (AR6)
Correct value provided?	Yes –273 tCO_2e/tN_2O Derived from IPCC Sixth Assessment Report (AR6)/46/
Has this value been verified?	Confirmed as correct for ex ante determination.
Has this value been verified?	Via checking the 100-year values are adopted from Chapter 7, Table 7.SM.7, IPCC Sixth Assessment Report (AR6)/46/ and VCS Standard Version 4.4/64/, it is verified that the value is correct.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

D_{CH4}	*Density of CH_4*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	The value is given in the applied methodology ACM0010 (Version 08)/51/.
Correct value provided?	Yes –0.00067 t/m^3 at room temperature 20°C and 1 atm pressure
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the applied methodology/51/
Choice of data correctly justified?	Yes

Measurement method correctly described?	N/A

MCF_j	*Methane conversion factor for the baseline $AWMS_j$*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10.17, chapter 10, volume 4
Correct value provided?	Yes – 71%
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/. A conservativeness factor has been applied by multiplying MCF_j value with a value of 0.94, to account for the 20 per cent uncertainty in the MCF_j values. For this project, the annual average temperature is 13℃ and the value of 71% is applied as reported by IPCC 2006/44/. Therefore, MCF_j value of 67% is applied.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$MS\%_{BL,j}$	*Fraction of manure handled in system j in the baseline*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	In this project, the baseline manure management system is uncovered anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is

	100%.
Correct value provided?	Yes – 100%
Has this value been verified?	Yes. Confirmed as correct for ex ante determination. The PER/5/and baseline evidence/31/ is checked and confirmed.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$W_{default}$	*Default average animal weight of a defined population*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4/46/
Correct value provided?	Yes – $W_{default}$(Market swine)=28 kg $W_{default}$(Breeding swine)=28 kg
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/46/ and the values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
Choice of data correctly justified?	Yes.
Measurement method correctly described?	N/A

$VS_{default}$	*Default value for the volatile solid excretion per day on a drymatter basis for a defined livestock population*
Title in line with Methodology?	Yes

Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4/39/
Correct value provided?	Yes – $VS_{default}$ (Market swine) =0.3 kg-dm/animal/day $VS_{default}$ (Breeding swine) =0.3 kg-dm/animal/day
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/ and the values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$NEX_{IPCC\ default}$	Default value for the nitrogen excretion per head of a defined livestock population
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Calculated by the equation: $NEX_{IPCC\ default} = N_{rate(T)} * TAM/1000*365$
Correct value provided?	Yes – $NEX_{IPCC\ default}$ (Market swine) =4.29 kg N/ animal/year $NEX_{IPCC\ default}$ (Breeding swine) =2.45 kg N/ animal/year
Has this value been verified?	Yes. Confirmed as correct for ex ante determination according to the calculation equation, while $NEX_{IPCC\ default}$ is calculated as equation 10.30 in IPCC 2006 and $N_{rate(T)}$ and TAM are default value from IPCC 2006.
Choice of data correctly justified?	Yes
Measurement method correctly	N/A

described?	

$N_{rate(T)}$	*Default N excretion rate*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10.19, chapter 10, volume 4 used for $NEX_{IPCC\ default}$ calculations as above equation
Correct value provided?	Yes – $N_{rate(T)}$ (Market swine) =0.42 kg N (1000 kg animal mass)$^{-1}$ day^{-1} $N_{rate(T)}$ (Breeding swine) =0.24 kg N (1000 kg animal mass)$^{-1}$ day^{-1}
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

TAM	*Typical animal mass for livestock category*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4 used for $NEX_{IPCC\ default}$ calculations as above equation
Correct value provided?	Yes – TAM (Market swine) =28 kg animal^{-1} TAM (Breeding swine) =28 kg animal^{-1}

Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$F_{gas\ MS,j,LT}$	Default values for nitrogen loss due to volatilisation of NH_3 and NO_X from manure management
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2019 table 10.22, chapter 10, volume 4 due to site specific data is unavailable
Correct value provided?	Yes – $F_{gas\ MS,1,LT}$=0.85 for the homogenization treatment stage of this project (corresponding to the treatment method in Table 10.22 of IPCC2019 as Aerobic treatment__Forced aeration systems), $F_{gas\ MS,2,LT}$=0.6 for the aerobic composting stage of this project (corresponding to the treatment method in Table 10.22 of IPCC2019 as Composting_In Vessel), $F_{gas\ MS,3,LT}$=0.5 for the anaerobic digestion step of this project (corresponding to the treatment method in Table 10.22 of IPCC2019 as Anaerobic digester).
Has this value been verified?	Yes. -- Through the PER/5/, EIA reports/6/, on-site visits and interview with the PP, CTI has verified the details of all treatment stages involved in this project. The homogenization treatment involves storing manure in an underground pool for 30 days with stirring rods for agitation. The aerobic composting treatment is equipped with a forced agitator and ventilation pipes. The technology used for

	anaerobic digestion is CSTR, with a reaction temperature between 32℃-38℃. By cross-referencing Table 10.22 of the IPCC2019/45/, CTI confirmed that the $F_{gas\ MS,j,LT}$ for each treatment stage is reasonable and conservative.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$EF_{N2O,D,j}$	*Direct N_2O emission factor for the treatment system j of the manure management system*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 table 10.21, chapter 10, volume 4 due to site specific data is unavailable
Correct value provided?	Yes – $EF_{N2O,D,1}$=0.01 for the homogenization treatment stage of this project (corresponding to the treatment method in Table 10.21 of IPCC2006 as Aerobic treatment__Natural aeration systems), $EF_{N2O,D,2}$=0.006 for the aerobic composting stage of this project (corresponding to the treatment method in Table 10.21 of IPCC2006 as Composting_In Vessel), $EF_{N2O,D,3}$=0 for the anaerobic digestion step of this project (corresponding to the treatment method in Table 10.21 of IPCC2006 as Anaerobic digester).
Has this value been verified?	Yes.-- Through the PER/5/, EIA reports/6/, on-site visits and interview with the PP, CTI has verified the details of all treatment stages involved in this project. The homogenization treatment involves storing manure in an underground pool for 30 days with stirring rods for agitation.

	The aerobic composting treatment is equipped with a forced agitator and ventilation pipes. The technology used for anaerobic digestion is CSTR, with a reaction temperature between 32℃-38℃. By cross-referencing Table 10.21 of the IPCC2006/44/, CTI confirmed that the $EF_{N2O,ID,j}$ for each treatment stage is reasonable and conservative.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$EF_{N2O,ID}$	*Indirect N_2O emission factor for N_2O emissions from atmospheric deposition of nitrogen on soils and water surfaces*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Default values for EF_4 from table 11.3, chapter 11, volume 4 of IPCC 2006
Correct value provided?	Yes – 0.01 kgN_2O-N/kg NH_3-N and NO_X-N
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$EF_{CH4,default}$	*Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes

Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Tool 14: "Project and leakage emissions from anaerobic digesters (version 02.0)"/57/ for CSTR (Continuous Stirred-Tank Reactor) type digesters
Correct value provided?	Yes – 0.028 t CH_4 leaked / t CH_4 produced
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the tool/57/. Via checking the anaerobic digester purchase contract/8/, CTI confirmed that the digestion tank on site has an integral structure with a membrane biogas storage tank, for which a value of 0.028 is applicable, the information in the JPM is correct and actual which is identified by manufacturer information.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$R_{VS,n}$	Fraction of volatile solid degraded in AWMS treatment method n of the N treatment steps prior to waste being treated
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Appendix 1 of methodology ACM0010/51/
Correct value provided?	Yes –

--	treatment	$R_{VS,n}$	value
Baseline scenario	uncovered anaerobic lagoon	$R_{VS,0}$	85%
Project activity	pre-treatment	$R_{VS,1}$	20%

	<table><tr><td></td><td>anaerobic-aerobic combined treatment</td><td>$R_{VS,2}$</td><td>80%</td></tr></table>
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the Appendix 1 of methodology ACM0010/51/. Via checking Appendix 1 of methodology ACM0010/51/, CTI confirmed that before the treated manure is applied to the land, it undergoes two stages of pre-treatment and an anaerobic-aerobic combined treatment technology, the pre-treatment belong to underfloor pit storage in the Appendix 1 of applied methodology ACM0010 (version 08.0), so, the $R_{VS,n}$ is 20% which is the most conservative value. The anaerobic-aerobic combined treatment technology belongs to covered first cell of two cell lagoon in the Appendix 1 of applied methodology ACM0010 (version 08.0), so the $R_{VS,n}$ 80% which is the most conservative value. Via checking Appendix 1 of methodology ACM0010/51/, CTI confirmed that the baseline is uncovered anaerobic lagoon which belongs to the anaerobic treatment of One-cell lagoon in the Appendix 1 of applied methodology ACM0010 (version 08.0), so, the $R_{VS,n}$ is 85% which is the most conservative value.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$R_{N,n}$	*Nitrogen reduction factor*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Appendix 1 of methodology ACM0010/51/

<table>
<tr><td>Correct value provided?</td><td>Yes –
<table>
<tr><td>--</td><td>treatment</td><td>$R_{N,n}$</td><td>value</td></tr>
<tr><td>Baseline scenario</td><td>uncovered anaerobic lagoon</td><td>$R_{N,0}$</td><td>80%</td></tr>
<tr><td rowspan="2">Project activity</td><td>pre-treatment</td><td>$R_{N,1}$</td><td>5%</td></tr>
<tr><td>anaerobic-aerobic combined treatment</td><td>$R_{N,2}$</td><td>25%</td></tr>
</table></td></tr>
<tr><td>Has this value been verified?</td><td>Yes. Confirmed as correct for ex ante determination as per the Appendix 1 of methodology ACM0010/51/.

Via checking Appendix 1 of methodology ACM0010/51/, CTI confirmed that before the treated manure is applied to the land, it undergoes two stages of pre-treatment and the an anaerobicaerobic combined treatment technology, the pre-treatment belong to underfloor pit storage in the Appendix 1 of applied methodology ACM0010 (version 08.0), so, the $R_{N,n}$ is 5% which is the most conservative value. The anaerobic-aerobic combined treatment technology belongs to covered first cell of two cell lagoon in the Appendix 1 of applied methodology ACM0010 (version 08.0), so the $R_{N,n}$ is 25% which is the most conservative value.

Via checking Appendix 1 of methodology ACM0010/51/, CTI confirmed that the baseline is uncovered anaerobic lagoon which similar to the anaerobic treatment of One-cell lagoon in the Appendix 1 of applied methodology ACM0010 (version 08.0), so, the $R_{N,n}$ is 80% which is the most conservative value</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes</td></tr>
<tr><td>Measurement method correctly described?</td><td>N/A</td></tr>
</table>

EF_1, EF_4, EF_5	*Emission factor for N_2O emissions from N inputs; from N leaching and runoff; from atmospheric deposition of N on soils and water surfaces*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC 2006 Guidelines default values are be used, since country specific or region specific data are not available. EF_1 from table 11.1, chapter 11, volume 4. EF_4 and EF_5 from table 11.3, chapter 11, volume 4 due to site specific data is unavailable
Correct value provided?	Yes – EF_1 = 0.010 kg N_2O-N/kg N EF_4 =0.010 kg N_2O-N/(kg NH_3-N and NO_X-N EF_5 = 0.0075 kg N_2O-N/kg N
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

F_{gasm}	Fraction of N lost due to volatilization
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines due to site specific data is unavailable
Correct value provided?	Yes – 0.2

Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

F_{leach}	*Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines due to site specific data is unavailable
Correct value provided?	Yes – 0.3
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the IPCC/44/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

MCF_d	*Methane conversion factor for leakage calculation*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Methodology ACM0010 (version 08.0)/51/
Correct value provided?	Yes – 1

Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the applied methodology/51/. Methane conversion factor for leakage calculation assumed to be equal 1.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$EF_{EF,j,y}$	*Emission factor for electricity generation*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Issued EF data of NCPG from China DNA/66/ as per the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation"/53/
Correct value provided?	Yes –0.66645 tCO_2/MWh
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the DNA data/73/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

R_u	*Universal ideal gases constant*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/56/
Correct value provided?	Yes –8,314 Pa.m^3/kmol.K

Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the applied Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/56/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

MM_i	*Molecular mass of greenhouse gas i*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/56/
Correct value provided?	Yes –16.04 kg/kmol for methane
Has this value been verified?	Yes. Confirmed as correct for ex ante determination as per the applied Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/56/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$\eta_{flare,m}$	Flare efficiency in minute m
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	“Project emissions from flaring (version 04.0)”/54/
Correct value provided?	Yes – 0% is the conservative value

Has this value been verified?	Yes. Confirmed as correct open flare as per the applied Project emissions from flaring (version 04.0)"/54/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

Q_{CH4}	*Quantity of methane produced in the anaerobic digester in year y*
Title in line with Methodology?	Yes
Ex-ante Value	1,940 tCH_4
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- The ex-ante value 1,940 tCH_4 are expected to be generated by the project annually is derived from PER/5/
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 1,940 tCH_4 are expected to be generated by the project annually is derived from PER/5/
Choice of data correctly justified?	Yes
Measurement method correctly described?	Calculated using Equation 19 in monitoring periods; For PE calculation in ex ante calculation

N_{LT}	*Annual average number of animals of type LT for the year y* *(number)*
Title in line with Methodology?	Yes
Ex-ante Value	Market swine: 41,935 Breeding swine: 5,885

Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- The ex-ante values of 5,885 heads of breeding swine and 41,935 heads of market swine for N_{LT} are derived from PER/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values of 5,885 heads of breeding swine and 41,935 heads of market swine for N_{LT} are derived from PER/5/
Choice of data correctly justified?	Yes
Measurement method correctly described?	For BE, PE and LE calculation in ex ante calculation; Calculated using Equation 5 in monitoring periods

2. Date and parameters Monitored

The monitoring parameters required by the methodology and applicable tools for the project are summarized in the below table.

$N_{AA,LT}$	*Daily stock of animals in the farm, discounting dead and discarded animals*
Title in line with Methodology?	Yes
Ex-ante Value	/
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $N_{AA,LT}$ will be monitored by PP daily. In the actual operation of the project, the PP monitors the daily stock data of breeding and marker swine in the farm, thereby fulfilling the requirements of ACM0010 to calculate N_{LT} using option 2. Each day, dedicated farm personnel meticulously record the number of animals purchased, transferred from one growth

	stage to the next, sold, and removed due to disease, etc., in a feeding log. These daily statistics of animal inflow and outflow, which also serve as the basis for calculating the daily stock of animals, are then uploaded into the farm's financial system. Utilizing the previous day's stock data, the financial system autonomously generates the current day's stock data. This effectively records the daily stock of animals ($N_{AA,LT}$) in the farm, discounting dead and discarded animals. CTI confirmed that PP monitors $N_{AA,LT}$ in the reliable and traceable manner described above by reviewing the daily inflow and outflow data recorded by the feeders responsible for each growth stage/24/, as well as purchase invoices/26/, financial systems/22/, the daily stock data exported from the financial system/25/ and on-site visits with PP. The ex-ante values of 5,885 heads of breeding swine and 41,935 heads of market swine for N_{LT} are derived from PER/5/. In the ex-ante calculation, the PP directly applied the annual stocking data from the PER as N_{LT} for the estimation of emission reduction, which CTI deems to be reasonable.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values of 5,885 heads of breeding swine and 41,935 heads of market swine for N_{LT} are derived from PER/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –Via site inspection of the financial system/22/ and feeding log/24/, CTI confirmed that dedicated farm personnel record the inflow and outflow data of each swine (market and breeding swine) at each growth stage every day and upload it to the financial system to generate the daily stock data in the financial system and the monitoring will be conducted as per the request in the Joint-PD-MR which in compliance with the applied methodology.
Monitoring frequency correctly described?	Monitored monthly - verified as per the applied methodology
Monitoring equipment correctly described?	N/A

QA/QC procedure correctly described?	Yes - Via site inspection of the financial system/22/ and feeding log/24/ and purchase invoices/26/, CTI confirmed that the dedicated farm personnel record the inflow and outflow data of each swine (market and breeding swine) at each growth stage every day and upload it to the financial system to generate the daily stock data in the financial system. Swine purchase invoices and farm logs can be used for cross-checking.
Purpose of data?	BE, PE and LE calculation

W_{site}	*Average animal weight of a defined livestock population at the project site*
Title in line with Methodology?	Yes
Ex-ante Value	79kg for market swine and 93kg for breeding swine
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- W_{site} will be monitored by PP monthly. Sampling procedures will be used to estimate this variable following guidance as provided in the methodology. The ex-ante value 79kg for market swine and 93kg for breeding swine are derived from PER/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 79kg for market swine and 93kg for breeding swine are derived from PER/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The Joint-PD-MR has described the system of random sampling taking into account stratification of the livestock population into a minimum of three weight categories as per the request in the applied methodology/51/.
Monitoring frequency correctly described?	Monitored monthly - verified as per the applied methodology
Monitoring equipment correctly	Yes - weight measurer

described?	
QA/QC procedure correctly described?	Yes - This parameter is used in equation 4 for estimating $VS_{LT,y}$ using option 3, and in equation 2 (appendix 2) for estimating $NEX_{LT,y}$ when using IPCC 2006 default values. The weight measurer will be calibrated according to the national regulation.
Purpose of data?	Used for estimating $VS_{LT,y}$ and $NEX_{IPCC,default}$

F_{Aer}	*Fraction of volatile solids directed to aerobic treatment*
Title in line with Methodology?	Yes
Ex-ante Value	100%
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- As this parameter is not monitored in the actual operation. so in the monitoring period, the value of this parameter in the emission reduction calculation is 100% which is confirmed as conservative. The ex-ante value 100% is derived from PER/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 100% is derived from PER/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – As this parameter is not monitored in the actual operation. so in the monitoring period, the value of this parameter in the emission reduction calculation is 100% which is confirmed as conservative. Therefore, CTI considered that it was reasonable to take a value of 1 for this parameter in the ex ante calculation.
Monitoring frequency correctly described?	Annually - verified as per the applied methodology
Monitoring equipment correctly described?	N/A

QA/QC procedure correctly described?	Yes - The value of this parameter in the emission reduction calculation is 100%, which is conservative.
Purpose of data?	PE calculation

n_{dy}	*Number of days treatment plant was operational in year y*
Title in line with Methodology?	Yes
Ex-ante Value	365 days
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- n_{dy} will be monitored by PP daily. The ex-ante value 365 days is total days for a year
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 365 days is confirmed as reasonable due to it is expected that the treatment plant operated everyday.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The number of of days treatment plant was operational will be recorded manually by the responsible staff.
Monitoring frequency correctly described?	Daily - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	BE, PE and LE calculation

v_f	*Biogas flow*
Title in line with Methodology?	Yes
Ex-ante Value	$482.59*10^4 m^3$

Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- v_f will be monitored by flow meters continuously and reported cumulatively on weekly basis by PP. The ex-ante value 482.59*$10^4$$m^3$ of biogas are expected to be generated by the project annually is derived from PER/5/
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 482.59*$10^4$$m^3$ of biogas are expected to be generated by the project annually is derived from PER/5/
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The biogas flow will be measured at four points. For the proposed project, based on the site inspection, it is confirmed that all the biogas generated are used for heat generation and the residual gas is sent to flare system, therefore the biogas generated from the anaerobic digestion, the amount of biogas used for heat generation and the amount of biogas flared by flare will be monitored through the flow meters.
Monitoring frequency correctly described?	Continuously by flow meter and reported cumulatively on weekly basis - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - flow meters
QA/QC procedure correctly described?	Yes - The calibration of flow meters, including the frequency of calibration, should be done in accordance with national standards or requirements.
Purpose of data?	PE calculation in ex ante calculation

$EC_{PJ,j,y}$	*The total electricity consumption associated with the anaerobic digestion facilityin year y*
Title in line with Methodology?	Yes
Ex-ante Value	2,680 MWh

Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $EC_{PJ,j,y}$ will be monitored by electricity meters continuously and at least monthly recording by PP. CTI confirmed an annual electricity consumption of 2,680 MWh derived from the PER/5/, which includes the power usage for the swine farm and all electricity consumption at the project site. So, CTI considered the value of this parameter to be conservative.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value is 2,680 MWh is confirmed as reasonable by checking PER/5/ and the actual power of the equipment/14/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The electricity consumption will be measured by electricity meters. The electricity consumption supplied by the gird company, then the value will be determined by the electricity meters monitoring and cross-check with the grid statement.
Monitoring frequency correctly described?	Continuous measurement and at least monthly recording - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - electricity meters
QA/QC procedure correctly described?	Yes - The calibration of electricity meters, including the frequency of calibration, should be done in accordance with national standards or requirements
Purpose of data?	PE calculation

$TDL_{j,y}$	*Average technical transmission and distribution losses for providing electricity to source j in year y*
Title in line with Methodology?	Yes

Ex-ante Value	20%
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/53/
Correct value provided?	Yes
Has this value been verified?	Yes – default value of 20% is used, which is conservative
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/53/
Monitoring frequency correctly described?	Value will change once the tool is updated - verified as per the tool
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation

$V_{t,db}$	*Volumetric flow of the gaseous stream in time interval t on a dry basis*
Title in line with Methodology?	Yes
Ex-ante Value	N/A
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $V_{t,db}$ will be monitored by flowmeters continuously. The ex-ante value was estimated according to the amount of manure.

Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value was estimated according to the amount of manure.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –monitored by flowmeters continuously. Volumetric flow measurement should always refer to the actual pressure and temperature.
Monitoring frequency correctly described?	Continuous measurement - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - flow meters
QA/QC procedure correctly described?	Yes - The periodic calibration against a primary device provided by an independent accredited laboratory is mandatory, the calibration and frequency of calibration should be in accordance with manufacturer's specifications.
Purpose of data?	PE calculation

$v_{i,t,db}$	*Volumetric fraction of greenhouse gas i in a time interval t on a dry basis*
Title in line with Methodology?	Yes
Ex-ante Value	N/A
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $v_{i,t,db}$ will be monitored by gas analyzers continuously.
Correct value provided?	Yes
Has this value been verified?	N/A
Choice of data correctly justified?	N/A
Measurement method correctly described?	Yes –monitored by gas analyzers continuously. Continuous gas analysers operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure

	and temperature.
Monitoring frequency correctly described?	Continuous measurement - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - gas analyzers
QA/QC procedure correctly described?	Yes - Calibration should include zero verification with an inert gas (e.g. N_2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). All calibration gases must have a certificate provided by the manufacturer and must be under their validity period.
Purpose of data?	PE calculation

T_t	*Temperature of the gaseous stream in time interval t*
Title in line with Methodology?	Yes
Ex-ante Value	293.15 K
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- T_t will be monitored by recordable electronic signal continuously. The temperature T_t(K) is calculated as the equation T(K)=t(°C) +273.15 The ex-ante value was estimated according to the applied methodology/51/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value was estimated according to the applied methodology/51/.
Choice of data correctly justified?	Yes

Measurement method correctly described?	Yes –monitored by recordable electronic signal continuously. Instruments with recordable electronic signal (analogical or digital) are required. Examples include thermocouples, thermo resistance, etc Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency)
Monitoring frequency correctly described?	Continuous unless differently specified in the underlying methodology - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - Instruments with recordable electronic signal (analogical or digital)
QA/QC procedure correctly described?	Yes - Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications.
Purpose of data?	PE calculation

P_t	*Pressure of the gaseous stream in time interval t*
Title in line with Methodology?	Yes
Ex-ante Value	101.325 kPa
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- P_t will be monitored by recordable electronic signal continuously. The ex-ante value was estimated according to the applied methodology/51/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value was estimated according to the applied methodology/51/.
Choice of data correctly justified?	Yes

Measurement method correctly described?	Yes –monitored by recordable electronic signal continuously. Instruments with recordable electronic signal (analogical or digital) are required. Examples include pressure transducers, etc. Provided all parameters are converted to normal conditions during the monitoring process, this parameter may not be needed except for moisture content determination and therefore it should be metered only when performing such measurements (with same frequency)
Monitoring frequency correctly described?	Continuous unless differently specified in the underlying methodology - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - Instruments with recordable electronic signal (analogical or digital)
QA/QC procedure correctly described?	Yes - Periodic calibration against a primary device provided by an independent accredited laboratory is mandatory. Calibration and frequency of calibration is according to manufacturer's specifications.
Purpose of data?	PE calculation

$MS\%_j$	*Fraction of manure handled in system j in project activity*
Title in line with Methodology?	Yes
Ex-ante Value	In the ex-ante calculation of $PE_{N2O,y}$, $MS\%_1$=100%,$MS\%_2$=$MS\%_3$=50% were used to distinguish the proportions of manure to be treated in the homogenization treatment, aerobic composting, and anaerobic digestion stages respectively. In other ex-ante calculations and actual emission reduction calculations, no distinction is made, all $MS\%_j$ values are 100%.
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- All the manure flew into AWMSs to be treated; no any manure will be discharged outside. Therefore, the value of this parameter is 100%. The value used is 100% for ex-ante determination for

	conservative.
Correct value provided?	Yes
Has this value been verified?	Yes - The value used is 100% for ex-ante determination for conservative.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – CTI has confirmed through the PER/5/ that 50% is derived from the estimated separation efficiency of the solid-liquid separation equipment stated in the PER/5/. In actual operation, as there is no monitoring equipment installed at the project site to measure the volume to be treated separately entering the anaerobic digester and the aerobic composting workshop, PP assigned a value of 100% for both parameters in the actual emission reduction calculation process. CTI has also confirmed the solid-liquid separation equipment taken from the PER/5/ is reasonable by reviewing the EIA/6/ and the technical agreement for the solid-liquid separation equipment. Thus, it confirms that the values of $MS\%_j$ in the ex-ante calculations are reasonable, and the values of $MS\%_j$ in the actual calculations are conservative.
Monitoring frequency correctly described?	Annually - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes - 100% is the maximum value and conservative.
Purpose of data?	PE and LE calculation

$\rho_{i,t}$	*Density of greenhouse gas i in the gaseous stream in time interval t*

Title in line with Methodology?	Yes
Ex-ante Value	0.00067 t/m^3
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- The actual value will be calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t. The ex-ante value is derived from applied methodology.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value was estimated according to the applied methodology/51/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The actual value will be calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t.
Monitoring frequency correctly described?	Pressure and temperature are measured continuously - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes - Calculated value according to the pressure and temperature
Purpose of data?	PE calculation

$B_{0,LT}$	*Maximum methane producing potential of the volatile solid generated by animal type LT*
Title in line with Methodology?	Yes
Ex-ante Value	$B_{0,LT}$ (Market swine) =0.29 $B_{0,LT}$ (Breeding swine) =0.29
Data unit correctly expressed?	Yes
Appropriate description?	Yes

Source clearly referenced? (appropriate?)	Yes- $B_{0,LT}$ can be measured as per ISO 11734:1995. As this parameter is not monitored in the actual operation. So, in the monitoring period, ex-ante determined values are still applied which was confirmed to be in accordance with the requirements in the methodology. The value used is derived from Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter 10, the maximum methane producing potential ($B_{0,LT}$) for Market swine and Breeding swine in Asia region in IPCC/44/.
Correct value provided?	Yes
Has this value been verified?	Yes - While the actual methane producing potential of the volatile solid generated by swine manure is 479.4ml/g VS via checking the public literature/76/, which is higher. Therefore 0.29 m^3CH_4/kg -dm applied is conservative.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –As this parameter is not monitored in the actual operation. So, in the monitoring period, ex-ante determined values are still applied which is verified as conservative
Monitoring frequency correctly described?	Annually - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes – The values will be updated based on latest available data from IPCC
Purpose of data?	BE, PE, LE calculation

Type	*Type of barn and AWMS*
Title in line with Methodology?	Yes
Ex-ante Value	N/A
Data unit correctly expressed?	Yes
Appropriate description?	Yes

Source clearly referenced? (appropriate?)	Yes- Type will be monitored by PP. The swine barn and AWMS layout and configuration are collected for check if the type changed.
Correct value provided?	Yes
Has this value been verified?	Yes - Due to the project has been approved by government, it will not be changed during the implementation periods, hence the Type of barn and AWMS will not be changed.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The swine barn and AWMS layout and configuration are collected for check if the type changed.
Monitoring frequency correctly described?	Once for each monitoring period - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes –After the first verification, only changes in the type of barn and AWMS will be reported.
Purpose of data?	Confirm whether the implementation of project as design

T	*Annual average ambient temperature at project site*
Title in line with Methodology?	Yes
Ex-ante Value	13°C
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- This parameter will be monitored monthly by checking the annual average ambient temperature at project site from public website monthly. The value used is 13°C for ex-ante determination which is derived from public website/75/.
Correct value provided?	Yes
Has this value been verified?	Yes - This parameter will be monitored monthly by checking the annual average ambient temperature at project site from public website monthly.

Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –Data sourced from Official public information
Monitoring frequency correctly described?	Monthly- verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes –The actual temperature during the monitoring period will be compared with the value of ex-ante estimated, i.e., 13 °C, and to be conservative, corresponding MCF_j with lower annual average ambient temperature as per Appendix 3 of ACM0010 (Version 08.0) will be used for calculation after comparing the actual value and the value of ex-ante estimated.
Purpose of data?	Used to select the annual MCF_j from IPCC 2006 Guidelines

$NEX_{LT,y}$	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr)
Title in line with Methodology?	Yes
Ex-ante Value	$NEX_{LT,y}$(Market swine) =12.1 $NEX_{LT,y}$ (Breeding swine) =8.14
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	The parameter is calculated as the equation of option 2 in Appendix 2 of methodology ACM0010 Version 08 and the value of other parameter applied in the equation is taken from published sources (IPCC 2006). The value should be updated on latest available public data source. QA/QC procedure for W_{site}, please refer to the monitoring parameter W_{site}
Correct value provided?	Yes
Has this value been verified?	Yes - The parameter is calculated as the equation of option 2 in Appendix 2 of methodology ACM0010 Version 08 and the

	value of other parameter applied in the equation is taken from published sources (IPCC 2006). The value should be updated on latest available public data source. QA/QC procedure for W_{site}, please refer to the monitoring parameter W_{site}
Choice of data correctly justified?	Yes
Measurement method correctly described?	Calculated by Equation 9 and Equation 10 $$NEX_{LT,y} = \frac{W_{site}}{W_{default}} \times NEX_{IPCC,default}$$ **Equation 9** $$NEX_{IPCC,default} = N_{rete(T)} \times \frac{TAM}{1000} \times 365$$ **Equation 10**
Monitoring frequency correctly described?	Annually- verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	QA/QC procedure for W_{site}, please refer to the monitoring parameter W_{site}
Purpose of data?	Used to calculation of BE and PE

3. Monitoring plan

The VVB has checked the monitoring plan of the Joint-PD-MR against the applied methodology.

The monitoring plan in the Joint-PD-MR has been designed to comply with the latest applicable version of the methodology (ACM0010 Version 08).

The validation team evaluated the feasibility and sufficiency of the monitoring plan. The key components of the monitoring plan are as follows.

Monitoring framework:

The Joint-PD-MR contains a diagram illustrating the Organization Structure of the Monitoring Team to be implemented by the project owner in order to implement the project activity. The VCS monitoring team will be responsible for the monitoring of all the parameters to be monitored. And all the data will be reviewed by the project developer and VVB. The organizational structure is

considered sufficient to fulfil the monitoring requirements of the methodology and to ensure that emission reductions can be verified.

Monitoring equipment and installation:

Measurement instruments are described in the monitoring plan as subject to appropriate national standards with respect to installation, accuracy and calibration interval. Main instruments flow meters, electricity meters, weight measurers, gas analyzers are used to monitor related parameters as assessed in the above tables of monitored parameters.

This equipment setup is considered sufficient to carry out the monitoring requirements of the methodology, and the appropriate national standards will be followed.

Principle of Monitoring:

Listed as above table for each monitored value and assessed by VVB.

Parameters to be monitored:

Listed as above tables and assessed by VVB accordingly.

Quality assurance and quality control procedures:

The Joint-PD-MR contains sufficient description on how quality will be controlled and assured in the monitoring of emission reductions.

Training:

Training will be provided to relevant personnel.

Data management:

All data collected as part of monitoring plan will be archived electronically on hard disks and be kept at least 2 years after the end of the last crediting period.

Corrective actions:

In case of nonconformities would be observed, a corrective action plan will be established and the whole VCS monitoring team will follow recognized standard data evaluation methods to guarantee that the data is reliable and accurate.

Sample Plan:

Sample plan is designed by PP for monitoring the parameter Wsite which is confirmed in line with the requirement for this parameter monitoring in the applied methodology. The sample plan is designed according to the Standard of “Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)”/49/.

The sample plan including the below designs,

a. To ensure representativeness, the defined livestock population should be classified into a minimum of three age categories - verified as in line with the applied methodology;

b. For the defined livestock population, a minimum of one monthly sample per age category should be taken - verified as in line with the applied methodology;

c. PP will use 95/10 confidence/precision as the criteria for the reliability of sampling efforts - verified as in line with the standard of “Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)” and applied methodology.

Via site inspection and interview with chiefs of farms and PP, CTI confirmed that the monitoring activities of the W_{site} will be conducted in the three age groups of Nursery phase, Growing phase and Mature phase (Nursery phase with 30-60 days, Growing phase with 60-110 days and Mature phase with 110-150 days. The three age categories of breeding swine are classified according to the age in days, i.e. Nursery phase with 30-70 days, Growing phase with 70-220 days and Mature phase with 220-310 days) in the swine farm at least one monthly which is verified as in line with the above requirements.

Via checking the request of applied methodology, it stated “The PD should describe the system of random sampling taking into account stratification of the livestock population into a minimum of three weight categories as described above”. Via site inspection, it is confirmed that for the swine farm involved, all the swine farms including market swine and breeding swine in stock. Due to the swine farm have two types of swine, and as per applied methodology, the defined livestock population should be classified into a minimum of three age categories, so the sampling method is chosen as Stratified random sampling which is confirmed as applicable to the project situation.

Hence, based on this, PP designed the sampling method as Stratified random sampling in 9 swine farms and divide the swine from each into at least 3 age groups, which is verified by CTI as correct and reasonable and in line with the request of applied methodology/51/.

The method of calculation of sample size is checked by CTI, it is confirmed that the calculation process is in compliance with the Appendix 6 of the Guideline of the “Sampling and surveys for CDM project activities and programmes of activities (Version 04.0)”/50/ and PP will use 95/10 confidence/precision as the criteria for the reliability of sampling efforts which is confirmed in line with Standard of “Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)”/49/.

The implementation of sample plan including monitoring, data recording and collection, QA/QC procedure, emergency procedure is stated by PP which is confirmed as actual and reasonable by site inspection and interview with the chief of farms and monitoring team. The one monthly monitoring activity of the samples will be completed in the swine farm during each monitoring periods. The monitoring forms will be filled out daily by the Breeders in the swine farm to record the animal weight of the samples. All the samples will be changed at the beginning of next monitoring periods which is confirmed as conservative and more representative.

1.1 Non–Permanence Risk Analysis

Not applicable for the present project activity.

4 VERIFICATION FINDINGS

Project Implementation Status

Through the onsite visit, interviewing the project developer and reviewing the project description in Joint-PD-MR/1/, it was confirmed that the project installed new Animal Manure Management Systems by replace the current open anaerobic lagoons with one set of new closed anaerobic digesters to the existing swine farm in Longnan City, Gansu Province, which will treat the manure and wastewater from the swine farm to avoid methane emissions generated in the baseline uncovered anaerobic lagoons.

By means of an in-depth review of the Joint-PD-MR and the checks carried out during the on-site visit, an assessment has been carried out whether the project has been implemented and operated in line with the Joint-PD-MR and whether all physical features of the project are in place. The following has been checked: implemented technology, project equipment as well as monitoring equipment.

CTI has performed a site visit to check the project equipment and interview with staffs from AWMS and the swine farms, in addition by all the provided evidence, it is found that the project implemented one set of AWMS in the existing swine farm involving 41,935 heads of market swine 5,885 heads of breeding swine. Live pigs are kept for 150 days in the farms before shipment and are estimated to produce 29,674.5 tons of manure and $482.59*10^4 m^3$ of biogas annually. The existing swine farm was put into operation before the implementation of this project since year 01/01/2021 which is verified by checking the swine farm's the record certificate/10/, the start order/11/, construction contract/12/ and the invoices for swine purchased in 01/2021/13/.

CTI, through the breeding logs/21/ and livestock data of the farm/24/, has confirmed that the farm operated well during the first monitoring period of the project, with a monthly average inventory of 38,697 market pigs and 5,064 breeding pigs. Furthermore, by reviewing the operation log of the project/25/, it is confirmed that all animal manure from the farm has treated in this project.

The project started construction on 03/03/2021 which has been confirmed by checking the equipment of purchase contracts/8/, and started commissioning on 15/05/2021 and the AMWS was put into operation on 01/06/2021 which has been confirmed by checking equipment of AWMS installation acceptance certificate/9/ and the operation log of the project/15/. The factors and parameters used during this monitoring period to arrive at the emission reduction calculations are transparently described in the Joint-PD-MR/1/.

By reviewing the operation log of the project/25/, inspecting data in the financial system on-site, and examining the records for organic fertilizer sales/29/, it was confirmed that the project generated a total of 7,111,953 m^3 of biogas during the first monitoring period. The biogas was entirely used to provide heat for the project and the pig farm operation. Approximately 7,130.60 tons of organic fertilizer was produced, of which 60% was given to local villagers for free and 40% was sold to local organic fertilizer producers.

During this monitoring period (01/06/2021 to 31/01/2023), there were total 773,941 heads of market swine, monthly average of 5,064 heads of breeding swine in the swine farms. Live pigs are kept for 150 days in the farms before shipment and produce 7,111,953 m^3 of biogas.

The actual operations during the 1st monitoring period are found in accordance with the descriptions provided in the Joint-PD-MR. There is no deviation / change evidenced during this monitoring period and there were no delays compared to information in approved project.

This verification covers the period from 01/06/2021 to 31/01/2023 (including both days). 58,604 tCO_2e emission reductions are claimed as VCUs during this monitoring period.

4.1 Accuracy of GHG Emission Reduction and Removal Calculations

1. Assessment of data and parameters available at validation

Via checking the Joint-PD-MR/1/, it is confirmed that all the ex-ante data and parameters are same to the Joint-PD-MR which is verified as correct. Refer to section 3.4.8 for the detail assessment of ex-ante parameters.

2. Assessment of date and parameters monitored

During the verification all relevant monitoring parameters (as listed in chapter 3.4.8 of this report) have been verified with regard to the

(i)appropriateness of the applied measurement / determination method,

(ii)the correctness of the values applied for ER calculation,

(iii)the accuracy, and applied QA/QC measures.

The monitoring results as well as the verification procedure are described parameter-wise in the below tables,

$N_{AA,LT}$	*Daily stock of animals in the farm, discounting dead and discarded animals*
Title in line with Methodology?	Yes
Data unit correctly	Yes –Number

expressed?	
Appropriate description?	Yes
Monitored Value?	Refer to ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes–Values of Monitoring parameter of $N_{AA,LT}$ were derived from Daily Breeding Pig stock record /24/ for this monitoring period.
Choice of data correctly justified?	Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes –This parameter is monitored daily through dedicated farm personnel record the inflow and outflow data of each swine (market and breeding swine) at each growth stage every day and upload it to the financial system to generate the daily stock data in the financial system. The data is recorded daily by the farm technicians, and the final daily inventory data is exported from the financial system, then cross-checked against the farm's logs/20/, as well as purchase and sale invoices/23/. Each day, dedicated farm personnel record the number of animals purchased, transferred from one growth stage to the next, sold, and removed due to disease, etc., in a feeding log. These daily statistics of animal inflow and outflow, which also serve as the basis for calculating the daily stock of animals, are then uploaded into the farm's financial system. Utilizing the previous day's stock data, the financial system autonomously generates the current day's stock data. This effectively records the daily stock of animals ($N_{AA,LT}$) in the farm, discounting dead and discarded animals. Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in Joint-PD-MR with the Daily Breeding Pig stock records/24/, feeding logs/20/ and invoice for the purchase of swine/23/, CTI verified that the data in Joint-PD-MR is correct.
Calculation method?	N/A
Monitoring frequency correctly described?	Monitored daily
Monitoring equipment	N/A

correctly described?	
QA/QC procedure correctly described?	N/A
Purpose of data?	BE, PE and LE calculation
Comments?	-

W_{site}	*Average animal weight of a defined livestock population at the project site*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes – kg
Appropriate description?	Yes
Monitored Value?	Refer to values provided in ER sheet/2/
Correct value provided?	Yes -
Source clearly referenced? (appropriate?)	Yes–Values of Monitoring parameter of W_{site} were derived from Weight records issued by PP/19/ for this monitoring period.
Choice of data correctly justified?	Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes – For monitoring this parameter, a sampling method has been used by PP following the applied methodology and Joint-PD-MR. Sample plan is designed for monitoring the parameter W_{site} which is confirmed in line with the requirement for this parameter monitoring in the applied methodology. The sample plan is designed according to the Standard of "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)"/49/. For this monitoring period, as per the sample plan in the JPM, below methods have been taken by PP to carry out the sampling, a. To determine the total population - Calculate the overall sample size based on the actual population of swine in stock firstly– the Production record of Market swine/18/ have been checked and the total population of pigs determined are verified as correct and actual; b. To determine the sample size for the swine farm - The project

	involved one swine farm (including market swine and breeding swine), then the sample size in the swine farm is adjusted based on the proportion of the number of the swine farm in the total number of the swine farm– the calculation sheet of sample size/20/ is checked as correct and actual; c. To determine the sample size of each age group - The sample size of each age group of Market swine and Breeding swine in the farm is also calculated based on the proportion of the number of each age group of Market swine and Breeding swine to the total number of swine in two kinds of the farm– the calculation sheet of sample size/20/ is checked as correct and actual; d. To ensure representativeness, the defined livestock population has been classified into a minimum of three age categories including Nursery phase, Growing phase and Mature phase – the monthly records of animal weight of a defined livestock population of three age categories/19/ have been checked and the three age categories determined are verified as in line with the Joint-PD-MR and applied methodology; e. After the sample size in each age group of Market swine and Breeding swine of the swine farm, the sample is conducted in the swine farm. Since swine in different age are kept in the different swine houses, samples can be randomly selected from pig houses of this age group – the samples choosing method is checked as correct and actual; f. For the defined livestock population, a minimum of one monthly sample per age category has been taken - the monthly records of animal weight of a defined livestock population of three age categories/19/ have been checked and one monthly sample per age category determined for the defined livestock population are verified as in line with the Joint-PD-MR and applied methodology; g. If the same samples are taken the following month, then new samples will be taken, this will be done every month until the end of the monitoring period - the monthly records of animal weight of a defined livestock population of three age categories/18/ have been checked and confirmed that the samples are not same for each month. PP uses 95/10 confidence/precision as the criteria for the reliability of sampling efforts - verified as in line with the standard of “Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)” and applied methodology. Via site inspection and interview with chiefs of farms, CTI confirmed that the monitoring activities of the W_{site} have been conducted in the three age groups of Nursery phase, Growing phase and Mature phase in the swine farm at least one monthly which is verified as in

<table>
<tr><td></td><td>line with the above requirements and the 95/10 confidence/precision is confirmed as used by PP as the criteria for the reliability of sampling efforts.

The one monthly monitoring activity of the samples have been completed in the swine farm during this monitoring period. The monitoring forms have been filled out by the Breeders in the swine farm to record the animal weight of the samples/19/.

The implementation of sampling method and process including monitoring, data recording and collection, QA/QC procedure, emergency procedure is stated by PP which is confirmed as actual and reasonable by site inspection and interview with the chief of farms and monitoring team.

Via checking the sampling method by reviewing the Weight records issued by PP/19/ and interview with technicians as stated in the MR, CTI verified that the sampling and recording method is in line with the monitoring plan and applied methodology/51/.

Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.</td></tr>
<tr><td>Calculation method?</td><td>N/A</td></tr>
<tr><td>Monitoring frequency correctly described?</td><td>Monitored monthly</td></tr>
<tr><td>Monitoring equipment correctly described?</td><td>Type: XD01

Accuracy: III level

The calibration information and validity is listed as below table
<table>
<tr><td>Serial No.</td><td>Calibrated Date</td><td>Validity</td></tr>
<tr><td rowspan="2">XD01-550</td><td>02/05/2021</td><td>01/05/2022</td></tr>
<tr><td>02/05/2022</td><td>01/05/2023</td></tr>
</table></td></tr>
<tr><td>QA/QC procedure correctly described?</td><td>Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/ in compliance with JJG539-2016 “Verification Regulation of Digital Indicating Weighting Instruments” in China/43/.</td></tr>
<tr><td>Purpose of data?</td><td>Used for estimating $VS_{LT,y}$</td></tr>
<tr><td>Comments?</td><td>-</td></tr>
</table>

F_{Aer}	*Fraction of volatile solids directed to aerobic treatment*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –Fraction
Appropriate description?	Yes
Monitored Value?	100%
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes– the value of F_{Aer} is applied as 100%, which is conservative
Choice of data correctly justified?	Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/
Measurement method and procedures correctly described?	Yes – During this monitoring period, there is no equip install in the project activity to monitor the influent into anaerobic digestion and aerobic system, therefore the value of F_{Aer} is applied as 100%, which is conservative.
Calculation method?	N/A
Monitoring frequency correctly described?	N/A
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	N/A

nd_y	*Number of days treatment plant was operational in year y*
Title in line with Methodology?	Yes
Data unit correctly	Yes –Number

expressed?	
Appropriate description?	Yes
Monitored Value?	610 days
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes– Monitoring parameter of nd_y was derived from daily operation record of the plant/25/
Choice of data correctly justified?	Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/
Measurement method and procedures correctly described?	Yes -PP record the actual number of days of treatment plant that was operational daily. Finally, the Daily operation record of treatment plant during this monitoring period were summarized by all the daily record. Via checking the Daily operation record of treatment plant/25/ and interview with monitoring staff and PP, CTI verified that the method is in line with the monitoring plan and applied methodology/51/
Calculation method?	N/A
Monitoring frequency correctly described?	Measured Daily
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	BE, PE and LE calculation
Comments?	N/A

v_f	*Biogas flow*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –m^3
Appropriate description?	Yes

<table>
<tr><td>Monitored Value?</td><td>Refer to ER sheet/2/</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced? (appropriate?)</td><td>Yes – Monitoring parameter of v_f was derived from Daily operation record/25/.</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/</td></tr>
<tr><td>Measurement method and procedures correctly described?</td><td>Yes -The biogas flow data were measured by the flow meters installed at treatment plant, flow meters 1 are installed at outlet of the anaerobic digestion (where the biogas has been dewatered and desulfurized), flow meter 2 are installed at the inlet of boiler and flow meter 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection.

The flow meters monitored data continuously, record hourly and saved automatically in the financial system.

The data can be obtained from financial system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record, then summarized as the monthly biogas production, biogas flow to the boiler and biogas flow to flare system is the sum of the daily output.

Via checking the measuring method by reviewing the Daily operation record/25/ and interview with monitoring staff, CTI verified that the method is in line with the applied methodology.</td></tr>
<tr><td>Calculation method?</td><td>N/A</td></tr>
<tr><td>Monitoring frequency correctly described?</td><td>Continuously by flow meters and reported hourly</td></tr>
<tr><td>Monitoring equipment correctly described?</td><td>For each flow meter, the calibration information and validity is listed as below table:
<table>
<tr><th></th><th>Serial No.</th><th>Type</th><th>Accuracy</th><th>Calibrated Date</th><th>Validity</th></tr>
<tr><td>Meter 1</td><td>S042104240157E</td><td>YC105Q</td><td>0.5</td><td rowspan="2">02/05/2021</td><td rowspan="2">02/05/2023</td></tr>
<tr><td>Meter</td><td>S042104240093E</td><td>YC105Q</td><td>0.5</td></tr>
</table></td></tr>
</table>

	<table><tr><td>2</td><td></td><td></td><td></td><td rowspan="2"></td><td rowspan="2"></td></tr><tr><td>Meter 3</td><td>S042104210008E</td><td>FCTMF-C100</td><td>0.5</td></tr></table>
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/ Via checking the calibration reports/15/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flow meter/41/. And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.
Purpose of data?	PE calculation
Comments?	N/A

$EC_{PJ,j,y}$	*The total electricity consumption associated with the anaerobic digestion facilityin year y*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –MWh
Appropriate description?	Yes
Monitored Value?	8,067.3 MWh
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value derived from Daily report of electricity/26/
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -The electricity consumptions were measured by the electricity meter 1 installed at treatment plant. Monitoring staff read the readings of electricity daily and recorded

	meter reading data into Daily report of electricity/26/ which includes the electricity consumption of the treatment plant daily, and then the electricity consumption is calculated for each month. Via checking the measuring method by reviewing the Daily operation record/26/ and interview with monitoring staff, CTI verified that the method is in line with the monitoring plan and applied tool/53/.
Calculation method?	N/A
Monitoring frequency correctly described?	Continuous measurement and daily recording
Monitoring equipment correctly described?	Accuracy: 0.1 Type: DTS1805 Series number: 57036703 Calibrated Date: 20/02/2021 Validity:17/02/2026
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration report/16/ which has been conducted by qualified party/17/. Via checking the calibration report/16/, CTI confirmed that the meter 1 are calibrated based on JJG 596-2012 Electrical Meters for Measuring Alternating-current Electrical Energy/40/ And based on this regulation, if the electricity meters can be used normally, recalibration is not required. The validity is five years. And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period. The electricity data is cross-checked with Grid Company Electricity Statement/27/.
Purpose of data?	PE calculation
Comments?	During this monitoring period, the electricity consumption of AWMSs were sourced from the grid company. Via checking the Daily report of electricity/26/ comparing with Grid Company Electricity Statement/27/, it is confirmed that the electricity

	consumed from power grid company is consistent.

$TDL_{j,y}$	*Average technical transmission and distribution losses for providing electricity to source j in year y*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –%
Appropriate description?	Yes
Monitored Value?	20
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes - Value is derived from Tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation" (version 03.0)/53/
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied tool/53/
Measurement method and procedures correctly described?	Yes -As per the tool of Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/53/, CTI confirmed that different values applied to different scenarios. For the project, the electricity consumption was derived from the power grid. Hence, scenario A: Electricity consumption from the grid is applied to this situation. For this situation, a default value of 20% is used for $TDL_{j,y}$ in line with the tool/53/ and it is confirmed that this value is the maximum value as per Methodology tool 05 Version 03.0 and conservative. Via checking the Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/53/, CTI confirmed that the data in MR is correct.
Calculation method?	N/A
Monitoring frequency correctly described?	Changed once the tool is updated.

Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	--

$V_{t,db}$	*Volumetric flow of the gaseous stream in time interval t on a dry basis*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –m^3 dry gas/h
Appropriate description?	Yes
Monitored Value?	Refer to values in ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from Daily operation record/25/ saved automatically in the financial system
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -The biogas flow data were measured by the flow meters installed at treatment plant, flow meters 1 are installed at outlet of the anaerobic digestion (where the biogas has been dewatered and desulfurized) and flow meter 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection. CTI confirmed that the measurement method is actual and the gaseous stream is defined as dry according to the Tool 8:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)"/56/. Hence the monitoring parameter Vt,db does not need to be calculated based on the wet basis flow plus water concentration.

<table>
<tr><td></td><td>The data can be obtained from financial system and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily biogas flow is equal to the cumulative value of 24 hours, and monthly biogas flow can be accumulated on daily basis.

Via checking the measuring method by reviewing the Daily operation record/25/ and interview with monitoring staff, CTI verified that the method is in line with the tool and applied methodology.</td></tr>
<tr><td>Calculation method?</td><td>N/A</td></tr>
<tr><td>Monitoring frequency correctly described?</td><td>Continuously measurement</td></tr>
<tr><td>Monitoring equipment correctly described?</td><td>The calibration information and validity is listed as below table
<table>
<tr><th></th><th>Serial No.</th><th>Type</th><th>Accuracy</th><th>Calibrated Date</th><th>Validity</th></tr>
<tr><td>Meter 1</td><td>S042104240157E</td><td>YC105Q</td><td>0.5</td><td rowspan="2">02/05/2021</td><td rowspan="2">02/05/2023</td></tr>
<tr><td>Meter 3</td><td>S042104210008E</td><td>FCTMF-C100</td><td>0.5</td></tr>
</table></td></tr>
<tr><td>QA/QC procedure correctly described?</td><td>Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/.

Via checking the calibration reports/16/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flowmeter/41/.

And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.</td></tr>
<tr><td>Purpose of data?</td><td>PE calculation</td></tr>
<tr><td>Comments?</td><td>--</td></tr>
</table>

$v_{i,t,db}$	*Volumetric fraction of greenhouse gas i in a time interval t on a dry*

<table>
<tr><th></th><th>basis</th></tr>
<tr><td>Title in line with Methodology?</td><td>Yes</td></tr>
<tr><td>Data unit correctly expressed?</td><td>Yes –m^3 gas i/m^3 dry gas</td></tr>
<tr><td>Appropriate description?</td><td>Yes</td></tr>
<tr><td>Monitored Value?</td><td>Refer to values in ER sheet/2/</td></tr>
<tr><td>Correct value provided?</td><td>Yes</td></tr>
<tr><td>Source clearly referenced? (appropriate?)</td><td>Yes- Value is derived from Daily operation record/25/.</td></tr>
<tr><td>Choice of data correctly justified?</td><td>Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.</td></tr>
<tr><td>Measurement method and procedures correctly described?</td><td>Yes -The data are measured continuously and record hourly by online gas analysers installed at the outlet of the anaerobic digesters and saved automatically in the financial system. The data can be obtained from financial system and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly CH_4 concentration was calculated based on the 24-hour average and daily average CH_4 concentration and recorded finally in the Daily operation record/25/.

Via checking the measuring method by reviewing the Daily operation record/25/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the applied methodology.</td></tr>
<tr><td>Calculation method?</td><td>N/A</td></tr>
<tr><td>Monitoring frequency correctly described?</td><td>Continuous measurement</td></tr>
<tr><td>Monitoring equipment correctly described?</td><td>The calibration information and validity is listed as below table
<table>
<tr><th>Serial No.</th><th>Type</th><th>Accuracy</th><th>Calibrated Date</th><th>Validity</th></tr>
<tr><td>2008948194</td><td>PGAS-200</td><td>0.5</td><td>02/05/2021

02/05/202</td><td>01/05/2022

01/05/202</td></tr>
</table></td></tr>
</table>

	2 | 3
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/. Via checking the calibration reports/16/, CTI confirmed that all the gas analyzers are calibrated based on JJG693-2011 (Verification Regulation of Alarmer Detectors of Combustible Gas)/42/. And based on this regulation, the validity is one year. Calibration should include zero verification with an inert gas (e.g. N2) and at least one reading verification with a standard gas (single calibration gas or mixture calibration gas). And the zero verification with an inert gas (N2) and one reading verification with a standard gas (single calibration gas) are implemented in the process of calibration, which is confirmed as in accordance with JJG693-2011/42/. And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.
Purpose of data?	PE calculation
Comments?	--

T_t	*Temperature of the gaseous stream in time interval t*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –m^3 gas i/m^3 dry gas
Appropriate description?	Yes
Monitored Value?	Refer to values in ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from financial system/25/

Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -The biogas flow data were measured by the flow meters installed at treatment plant, flow meters 1 are installed at outlet of the anaerobic digestion (where the biogas has been dewatered and desulfurized), flow meter 2 are installed at the inlet of boiler and flow meter 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection. Via site inspection and checking the manufacture specification of the flow meter/30/, it is confirmed that the flow meter has the function to measure the pressure with recordable electronic signal (digital). The data are monitored continuously, record hourly and saved automatically in the financial system. The data for this monitoring period have been obtained from financial system and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly pressure was calculated based on the 24-hour average and daily average temperature. The readout of flowmeter was indicated degrees Celsius(°C). Therefore, the temperature Tt(K) is calculated as the equation T(K)=t(°C)+273.15. Via checking the measuring method by reviewing the Daily operation record/25/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the applied methodology.
Calculation method?	N/A
Monitoring frequency correctly described?	Continuously measurement
Monitoring equipment correctly described?	Refer to information for 3 flow meters above
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/. Via checking the calibration reports/16/, CTI confirmed that all the

	flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flow meter/41/. And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.
Purpose of data?	PE calculation
Comments?	--

P_t	*Pressure of the gaseous stream in time interval t*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –Pa
Appropriate description?	Yes
Monitored Value?	Refer to values in ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from financial system/25/.
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -The biogas flow data were measured by the flow meters installed at treatment plant, flow meters 1 are installed at outlet of the anaerobic digestion (where the biogas has been dewatered and desulfurized), flow meter 2 are installed at the inlet of boiler and flow meter 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection. Via site inspection and checking the manufacture specification of the flow meter/30/, it is confirmed that the flow meter has the function to measure the pressure with recordable electronic signal (digital). The data are monitored continuously, record hourly and saved

	automatically in the financial system. The data for this monitoring period have been obtained from financial system and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly pressure was calculated based on the 24-hour average and daily average pressure. Via checking the measuring method by reviewing the Daily operation record/25/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the applied methodology.
Calculation method?	N/A
Monitoring frequency correctly described?	Continuously measurement
Monitoring equipment correctly described?	Refer to information for 3 flow meters above
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/16/ which has been conducted by qualified parties/17/. Via checking the calibration reports/15/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flow meter/41/. And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.
Purpose of data?	PE calculation
Comments?	--

$\rho_{i,t}$	*Density of greenhouse gas i in the gaseous stream in time interval t*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –kg gas i/m^3 gas i
Appropriate description?	Yes

Monitored Value?	Refer to values in ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t.
Choice of data correctly justified?	Yes - the calculation methods are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -Calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t. The monitoring result of Pressure and temperature are listed in the above two tables.
Calculation method?	Calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t.
Monitoring frequency correctly described?	N/A
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	--

$MS\%_j$	*Fraction of manure handled in system j in project activity*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –Fraction
Appropriate description?	Yes

Monitored Value?	100%
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes-As no monitoring was conducted in the project activity to monitor the fraction of manure handled, hence using 100% as conservative.
Choice of data correctly justified?	Yes
Measurement method and procedures correctly described?	Yes -As this parameter is not monitored during this monitoring period. so, to be conservative, the value of this parameter in the emission reduction calculation is 100%. All the manure flew into AWMSs to be treated; no any manure will be discharged outside. Therefore, the value of this parameter is 100%
Calculation method?	N/A
Monitoring frequency correctly described?	Annually
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	--

$B_{0,LT}$	*Maximum methane producing potential of the volatile solid generated by animal type LT*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –m^3CH/kg -dm
Appropriate description?	Yes

Monitored Value?	$B_{0,LT}$ (Market swine) =0.29 $B_{0,LT}$ (Breeding swine) =0.29
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter10/44/
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -As no monitoring was conducted in the project activity to monitor the value, so, 0.29 m^3CH_4/kg-dm is still applied. The actual methane producing potential of the volatile solid generated by swine manure is 479.4ml/g VS via checking the public literature/76/, which is higher than Joint-PD-MR value, therefore 0.29 m^3CH_4/kg-dm applied in monitoring period is conservative.
Calculation method?	N/A
Monitoring frequency correctly described?	Annually
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes - The values will be updated based on latest available data from IPCC
Purpose of data?	BE, PE calculation
Comments?	--

$NEX_{LT,y}$	*Annual average nitrogen excretion per head of a defined livestock population estimated as described in Appendix 2*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes

Appropriate description?	Yes
Monitored Value?	Refer to values in ER sheet/2/
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – the value is calculated as the equation of option 2 in Appendix 2: $NEX_{LT,y} = \frac{W_{site}}{W_{default}} \times NEX_{IPCC,default}$ While, NEXIPCC default calculated as equation 30 of the IPCC 2006, volume 4, chapter 10 $NEX_{IPCC,default} = N_{rete(T)} \times \frac{TAM}{1000} \times 365$
Choice of data correctly justified?	Yes - the calculation is in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -$W_{default}$, $N_{rate(T)}$ and TAM are default value from IPCC 2006. The measurement methods and procedures for W_{site}, please refer to the monitoring parameter W_{site}
Calculation method?	$NEX_{LT,y} = \frac{W_{site}}{W_{default}} \times NEX_{IPCC,default}$
Monitoring frequency correctly described?	Annually - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes - The parameter is calculated as the equation of option 2 in Appendix 2 of methodology ACM0010 Version 08 and the value of other parameter applied in the equation is taken from published sources (2006 IPCC). The value should be updated on latest available public data source. QA/QC procedure for W_{site}, please refer to the monitoring parameter W_{site}
Purpose of data?	BE, PE calculation
Comments?	--

Type	*Type of barn and AWMS*
Title in line with Methodology?	Yes
Data unit correctly expressed?	--
Appropriate description?	Yes
Monitored Value?	--
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from layout and configuration are collected to confirm whether the implementation of project as design
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -This monitoring is the first monitoring period and in this monitoring period, the swine barn and AWMS layout and configuration/15/ are consistent with the design which is approved by the official government/7/.
Calculation method?	N/A
Monitoring frequency correctly described?	After the first verification, only changes in the type of barn and AWMS will be reported.
Monitoring equipment correctly described?	n/a
QA/QC procedure correctly described?	Yes - Due to the project has been approved by government, it will not be changed during the implementation periods, hence the Type of barn and AWMS will not be changed, hence type will not be monitored
Purpose of data?	BE, PE and LE calculation
Comments?	--

T	*Annual average ambient temperature at project site*
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –m^3CH/kg -dm
Appropriate description?	Yes
Monitored Value?	2021: 13℃ 2022: 13℃ 2023: N/A
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes- Value is derived from Gansu Province Bureau of Statistics/77/.
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/51/.
Measurement method and procedures correctly described?	Yes -This parameter monitored monthly by checking the annual average ambient temperature at project site from public website monthly. The parameter value should be updated upon the changes occur in the monitoring period.
Calculation method?	N/A
Monitoring frequency correctly described?	Annually
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes - Cross-Check with the value of ex-ante estimated, i.e., 13°C. MCF value is 71% with the same temperature of 13°C by comparing with the ex-ante value and year 2021 and year 2022 monitored values as per Appendix 3 of ACM0010 (Version 08.0). Then multiplying MCF values with a value of 0.94, so 67% of MCFj is used for calculation during in this monitoring period.

	For year 2023, due to the year not ended and the temperature in first 6 months cannot represent the annual average temperature of the whole year, hence MCFj of 67% is still applied for the period from 01/01/2023 to 31/01/2023, which is the same with the value in 2021. Via comparing with the ex-ante value, CTI confirmed that MCFj of 67% is applied in this monitoring period consistent with the value for ex-ante calculation.
Purpose of data?	Used to select the annual MCF_j from IPCC 2006 Guidelines
Comments?	--

3. Assessment of GHG emission reductions Quantity

Calculation of baseline GHG emissions or removals

According to the methodology and above all the formulars listed in section 3.4.6, baseline emissions are calculated using the following formula:

$$BE_y=BE_{CH4,y}+BE_{N2O,y}$$

The values monitored during monitoring survey are transparently shown in the Section 7.1 of Joint-PD-MR. During onsite, CTI cross-checked these values in detail using various supporting records and documents. Refer to the above section 3.4.8 of this report for ex-ante and above section 4.1 for ex-post parameters' assessment.

The Baseline Emissions during this monitoring period is summarized as below,

Date	$BE_{CH4,y}$ (tCO_2e)	$BE_{N2O,y}$ (tCO_2e)	BE_y (tCO_2e)
01/06/2021 to 31/12/2021	28,217	491	28,708
01/01/2022 to 31/12/2022	49,778	861	50,639
01/01/2023 to 31/01/2023	4,264	72	4,336
01/06/2021 to 31/01/2023	82,259	1,424	83,683

Total Baseline emissions of the 1st monitoring period is thus verified as 83,683 tCO_2e.

In conclusion, the calculations of baseline GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized baseline. Any assumptions used in

emission calculations have been justified. Appropriate emission factors, GWP and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified. It can be confirmed that the baseline calculation is overall correct.

Calculation of project GHG emissions or actual net GHG removals by sinks

According to the methodology, the project emissions are calculated using the following formula:

$PE_y=PE_{AD,y}+PE_{AER,y}+PE_{N20,y}$

$PE_{AD,y}= PE_{EC,y}+PE_{CH4,y}$

The values monitored during monitoring survey are transparently shown in the Section 6.1 of Joint-PD-MR. During onsite, CTI cross-checked these values in detail using various supporting records and documents. Refer to the above section 3.4.8 of this report for ex-ante and above section 4.1 for ex-post parameters' assessment.

So $PE_{AD,y}$ during this monitoring period is calculated as below table

Date	$PE_{EC,y}$ (tCO_2e)	$PE_{CH4,y}$ (tCO_2e)	$PE_{AD,y}$ (tCO_2e)
01/06/2021 to 31/12/2021	1,657	794	2,451
01/01/2022 to 31/12/2022	4,291	1,370	5,661
01/01/2023 to 31/01/2023	503	116	619
01/06/2021 to 31/01/2023	6,451	2,280	8,731

After reviewing the operational records /26/, conducting onsite inspections, and interviewing with staff, CTI confirmed that the project site does not have any equipment that uses fossil fuels, so no fossil fuels were used at the project site, meaning $PE_{FC,y}=0$.

So Project Emissions during this monitoring period is calculated as below table

Date	$PE_{AD,y}$ (tCO_2e)	$PE_{AER,y}$ (tCO_2e)	$PE_{N2O,y}$ (tCO_2e)	PE_y (tCO_2e)
01/06/2021 to 31/12/2021	2,451	34	4,263	6,748
01/01/2022 to 31/12/2022	5,661	60	7,475	13,196
01/01/2023 to 31/01/2023	619	5	629	1,253

01/06/2021 to 31/01/2023	8,731	99	12,367	21,197

In conclusion, the calculations of project GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized project. Any assumptions used in emission calculations have been justified. Appropriate emission factors, GWP and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified. It can be confirmed that the project calculation is overall correct.

Calculation of leakage GHG emissions

According to the methodology, the leakage emissions are calculated using the following formula:

$$LE_y = (LE_{PJ,N2O,y} - LE_{BL,N2O,y}) + (LE_{PJ,CH4,y} - LE_{BL,CH4,y})$$

The values monitored during monitoring survey are transparently shown in the Section 6.1 of Joint-PD-MR. During onsite, CTI cross-checked these values in detail using various supporting records and documents. Refer to the above section 3.4.8 of this report for ex-ante and above section 4.1 for ex-post parameters' assessment.

So Leakage Emissions during this monitoring period is calculated as below table

Date	$LE_{PJ,CH4,y}$ (tCO_2e)	$LE_{BL,CH4,y}$ (tCO_2e)	$LE_{PJ,N2O,y}$ (tCO_2e)	$LE_{BL,N2O,y}$ (tCO_2e)	PE_y (tCO_2e)
01/06/2021 to 31/12/2021	6,745	6,310	1,250	350	1,335
01/01/2022 to 31/12/2022	11,900	11,131	2,191	614	2,346
01/01/2023 to 31/01/2023	1,020	953	185	51	201
01/06/2021 to 31/01/2023	19,665	18,394	3,626	1,015	3,882

In conclusion, the calculations of leakage GHG emissions have been carried out in accordance with the formulae and methods described in the registered monitoring plan, the applied methodology and, where applicable, the applied standardized project. Any assumptions used in emission calculations have been justified. Appropriate emission factors, GWP and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified. It can be confirmed that the project calculation is overall correct.

Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

The VVB has checked the Joint-PD-MR includes a summary table of the emission reductions calculation. Summary of emission reductions during the monitoring period,

$$ER_y=BE_y - PE_y- LE_y$$

Furthermore, as per the applied methodology, if the actual methane captured from anaerobic digesters in project activity is lower than ($BE_{CH4,y}$ - $PE_{AD,y}$), then ($BE_{CH4,y}$ - $PE_{AD,y}$) is replaced by actual methane captured $Q_{CH4,y}$.

Biogas captured during monitoring period is 7,111,953 m^3, which equals to 81,034 tCO_2e that emission from methane production. Baseline methane emission ($BE_{CH4,y}$) is 82,259 tCO_2e. The project emissions associated with anaerobic digester is ($PE_{AD,y}$) is 8,731 tCO_2e. Actual methane captured from anaerobic digesters is higher than the difference of $BE_{CH4,y}$ and $PE_{AD,y}$. Therefore, the equation ($BE_{CH4,y}$ - $PE_{AD,y}$) can be used to calculate emission reduction.

Hence, the emission reductions during this monitoring period from 2021 to 2023 are summarized in the table below,

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01/06/2021 to 31/12/2021	28,708	6,748	1,335	20,625
01/01/2022 to 31/12/2022	50,639	13,196	2,346	35,097
01/01/2023 to 31/01/2023	4,336	1,253	201	2,882
01/06/2021 to 31/01/2023	83,683	21,197	3,882	58,604

All the figures as per the monitoring report were cross-checked by the VVB against basic monitored data. Refer to section 4.1 and 4.2 of this report for assessment details.

4.2 Quality of Evidence to Determine GHG Emission Reductions and Removals

Refer to section 4.1 above for the detail assessment of each monitoring parameters and Appendix 3 for the supporting evidence used to determine the GHG emission reductions. For each reported data, the evidence is provided and verified as sufficient and quality is appropriate. Also, the cross-checks have been performed on the reported data with different source of evidence. The information flow from data generation and aggregation, to recording, calculation and final transposition into the monitoring report has been assessed by VVB in section 4.1 for each parameter and also the calibration have been conducted as per the frequency of monitoring equipment defined in the Joint-PD-MR. Therefore, it is concluded that the evidence provided are verified as sufficient and quality is appropriate and thus the evidence can be used to determine the GHG emission reductions and removals for this monitoring period.

5 VALIDATION AND VERIFICATION CONCLUSION

Baineng New Energy (Shenzhen) Co.,Ltd. has commissioned the CTI to carry out the Verified Carbon Standard (VCS) joint validation and 1st periodic verification of the project activity Gansu Hui county Muge Swine Farm Manure Management System GHG Mitigation Project (VCS ID 3950), for the monitoring period from 01/06/2021 to 31/01/2023, with regard to the relevant requirements for VCS Standard Version 4.4. Based on the reviewing the documented evidence and by an on-site assessment, CTI can confirm that:

- the baseline scenario is correctly defined as per the applied methodology and relate tools;
- the project is additional;
- all data and information used for ex-ante calculation of emission reductions is of projected and/or hypothetical nature;
- the monitoring plan in the validated Joint-PD-MR is as per the applied baseline and monitoring methodology.
- the project has been implemented and operated as per the VCS Joint-PD-MR;
- the project complies with the validation and verification criteria for projects set out in VCS Standard Version 4.4;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS requirement and ACM0010 (Version 08);

- the monitoring is in place as per the applied baseline and monitoring methodology ACM0010 (Version 08);
- the monitoring complies with the monitoring plan in the validated Joint-PD-MR;

It is certified that the GHG emission reductions from the project during the monitoring period amount as follows:

Verification period: From 01/06/2021 to 31/01/2023

Verified GHG emission reductions and removals in the above verification period by vintage is:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
01/06/2021 to 31/12/2021	28,708	6,748	1,335	20,625
01/01/2022 to 31/12/2022	50,639	13,196	2,346	35,097
01/01/2023 to 31/01/2023	4,336	1,253	201	2,882
01/06/2021 to 31/01/2023	83,683	21,197	3,882	58,604

Zhang Lei

Mr. Zhang Lei
Team Leader
12-May-2023

Shunrong Lin

Ms. Lin Shunrong
Technical Reviewer
12-May-2023

APPENDIX1 ABBREVIATIONS

Abbreviations	Full texts
AFOLU	Agriculture, Forestry, and Other Land Use
AWMS	Animal waste management system
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CSTR	Continuous Stirred Tank Reactor
DNA	Designated National Authority
GHG	Greenhouse gas(es)
EIA	Environmental Impact Assessement
ER	Emission Reduction
ETS	Emission Trading Scheme
FAR	Forward Action Request
GHG	Greenhouse gas(es)
M&P	Modalities and Procedures
NCPG	Northwest China Power Grid
PD	Project Description
PDD	Project Design Document
PER	Project Evaluation Report
PP	Project Participant
PV	Photovoltaic
UNFCCC	United Nations Framework Convention on Climate Change

VVS	Validation and Verification Standard
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit
VVB	Validation/Verification Body

APPENDIX2 REFERENCE LIST

/1/	VCS Joint-PD-MR Version 01 dated 22/10/2022, final Version 03 dated 15/10/2023
/2/	Emission reduction spreadsheet for ex-ante estimation Emission reduction spreadsheet for the first monitoring period
/3/	NPV and IRR calculation sheet
/4/	IRR Calculation Table Considering Coal-Saving Income
/5/	Business License of Hui County Xingjiang Muge Breeding Co., LTD. Business License of Baineng New Energy (Shenzhen) Co.,Ltd.
/6/	Project Evaluation Report by Beijing Guohong Yingjie International Consulting Ltd. issued in 12/2020
/7/	Environment Impact Assessment (EIA) by Sichuan Tiyan Environmental Protection Technology Ltd. issued in 02/2021
/8/	EIA approval by Longnan Municipal Ecology and Environment Bureau, issued on 22/02/2021
/9/	Equipment of purchase contract (including biogas generator, anaerobic tank and Turnover machine etc.) signed with Qingdao Zhonghai Environmental Engineering Ltd. on 03/03/2021
/10/	Equipment of AWMS installation acceptance certificate signed with Qingdao Zhonghai Environmental Engineering Ltd.
/11/	The contracts for the heating system renovation and equipment purchase for the swine farm signed with Qingdao Zhonghai Environmental Engineering Ltd. on 03/04/2021
/12/	Swine farm project record certificate issued by Longnan City Hui County Agricultural and Rural Bureau in March 2020
/13/	Start order of swine farm project issued by Lonanke honest engineering supervision and consulting Ltd.
/14/	Construction contract of swine farm project with Hunan Xinyi Engineering Ltd.
/15/	Invoices for swine purchased in 01/2021 from swine farm
/16/	Technical agreement of main equipment
/17/	Technical flow charts in the project site

/18/	Calibration Reports to the electricity meter 1 with validity covering this monitoring period Calibration Reports to the Weight measurer with validity covering this monitoring period Calibration Reports to the gas analyser with validity covering this monitoring period Calibration Reports to all the flow meters with validity covering this monitoring period
/19/	Gansu Electric Power Company Electricity Metering Center metering authorization certificate issued on 01/04/2021, valid until 31/03/2024 Gansu Provincial Institute of Metrology measurement authorization certificate issued on 19/08/2022, valid until 18/08/2027
/20/	Production record of Market swine covering this monitoring period
/21/	Monthly records of animal weight of a defined livestock population of three age categories
/22/	Calculation sheet of sample size for monitoring W_{site}
/23/	Feeding logs of swine farm
/24/	Screenshot of the financial system
/25/	Invoice for the purchase and sale of swine
/26/	Daily breeding and market swine stock record of swine farm covering this monitoring period
/27/	Daily operation record of treatment plant covering this monitoring period
/28/	Daily report of electricity issued by PP for this monitoring period
/29/	Grid Company Electricity Statement issued by grid company for this monitoring period
/30/	Sale agreement of organic fertilizer
/31/	The sales records of organic fertilizer covering this monitoring period
/32/	Manufacture specification of the flow meter
/33/	Photo of baseline lagoon
/34/	Local stakeholder consultation process evidences (prior the project started construction) - The Meeting Notice Letter for invitation; - Minutes of meeting - Questionnaires

/35/	Local stakeholder consultation process evidences (on-going communication and consultation during this monitoring period) - Photos of public announcements posted in villages near the project location - Questionnaires by attendance in the Meeting - Input / Grievance Expression Process Book at the project site
/36/	Declaration of no double counting and not involved in other GHG scheme
/37/	Statement of emission reductions resulting from the abandonment of the alternative use of coal-fired heat
/38/	Labor contracts signed with employees for implementation of this project
/39/	Monthly salary slips for employees
/40/	Technical Training Records of project - Training Records in this monitoring period - Training register list
/41/	Design code for wastewater stabilization ponds (GJJ/T54-93)
/42/	Electrical Meters for Measuring Alternating-current Electrical Energy
/43/	Verification Regulation of Vortex-shedding Flow meter
/44/	Verification Regulation of Alarmer Detectors of Combustible Gas
/45/	Digital Indicator Scale Verification Regulations
/46/	2006 IPCC Guidelines for National Greenhouse Gas Inventories
/47/	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories
/48/	IPCC Sixth Assessment Report
/49/	Economic Evaluation Method and Parameter of Construction Projects
/50/	Notice on adjusting financial benchmark rate of return of construction projects in some industries
/51/	Standard of “Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)”
/52/	Guideline of the “Sampling and surveys for CDM project activities and programmes of activities (Version 04.0)”

/53/	ACM0010-“GHG emission reductions from manure management systems” (Version 08.0)
/54/	Tool02- Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)
/55/	Tool05- Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 3.0)
/56/	Tool06- Tool to calculate the emission factor for an electricity system (Version 07.0)
/57/	Tool 07 Tool to calculate the emission factor for an electricity system (Version 07.0)
/58/	Tool08- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 07.0)
/59/	Tool14- Project and leakage emissions from anaerobic digesters (Version 02.0)
/60/	Tool24- Common practice (Version 03.1)
/61/	Investment analysis (version 11.0)
/62/	VCS-Joint-Project-Description-Monitoring-Report-Template-v4.1
/63/	Registration and Issuance Process version 4.1
/64/	VCS Program Definitions, v4.3
/65/	VCS Program Guide, v4.3
/66/	VCS Standard Version 4.4
/67/	Applicability of sectoral scopes version 01.0
/68/	China CER platform http://cdm.ccchina.org.cn/ccer.a spx
/69/	UNFCCC website https://cdm.unfccc.int
/70/	VCS website https://verra.org/project/vcshttps://verra.org/project/vcs-program/program/
/71/	GS website http://globalgoals.goldstandard.o rg/
/72/	Number of days for pigs to be slaughtered by existing largescale breeding groups in China https://zhuanlan.zhihu.com/p/3 8676811 http://finance.people.com.cn/n 1/2017/1121/c100429658996.html
/73/	China cap & trade scheme http://www.mee.gov.cn/xxgk201 8/xxgk/xxgk02/202101/t20210

	105_816131.html
/74/	Enforced company list http://mee.gov.cn/xxgk2018/xxg k/xxgk03/202012/W02020123 0736907682380.pdf
/75/	2019 China regional power grid carbon dioxide baseline emission factor OM calculation instructions https://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/t20201229_815386.shtml
/76/	Public information of the project owner http://www.xjmgsp.com/
/77/	Public information of local temperature https://baike.baidu.com/item/%E5%9F%8E%E5%85%B3%E9%95%87/3468339
/78/	Public literature of methane producing potential of the volatile solid generated by swine manure http://www.doc88.com/p-9902182440715.html
/79/	Public information of local temperature for this monitoring period http://jx.cma.gov.cn/zfxxgk/zwgk/sjtj_1/202109/P020210909527255110935.pdf http://jx.ifeng.com/c/8CbtDjXPQ Lw
/80/	Price index of investment in fixed asset http://www.stats.gov.cn/
/81/	Local DRC of Gansu province website
/82/	Other public information from Department of Agriculture and rural affairs of Gansu Province http://nync.gansu.gov.cn/
/83/	Photo taken by VVB during site visit including main equipment, swine farms, monitoring devices, etc.
/84/	Law&Regulation 1.Farmland Irrigation Water Quality Standard (GB5084-2005); 2.Odor Pollutant Discharge Standard (GB14554-93); 3.Comprehensive Emission

	Standards for Air Polluted Areas (GB16297-1996); 4.Boiler Air Pollutant Emission Standard (GB13271-2014); 5.Environmental Noise Emission Standard for Industrial Enterprise Boundary (GB12348-2008) 6.Environmental Protection Law of P.R. China 7.Law of the People's Republic of China on the Environmental Impact Assessment
/85/	Technical specification for sanitation treatment of livestock and poultry manure GB-T 36195 https://oss.baigongbao.com/202 0/12/14/MRyhTKQcWC.pdf
/86/	Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming http://politics.people.com.cn/n/2013/1126/c1001-23662445.html
/87/	Specifications for the construction of manure resource utilization facilities for large-scale livestock and poultry farms (for trial implementation) http://www.moa.gov.cn/gk/tzgg_1/tfw/201801/t20180111_6134801.htm
/88/	Sludge management in anaerobic swine lagoons: A review https://www.x-mol.com/paper/1275511380841623552/t?recommendPaper=1213054167937126400
/89/	UNFCCC website available for searching Annex I countries： https://unfccc.int/process-and-meetings/the-convention/glossary-of-climate-change-acronyms-and-terms#a
/90/	The 2022 AWMS O&M cost breakdown
/91/	Heating Equipment Procurement and Installation Contract, signed with Xi'an Yi Mai New Energy Technology Co,. Ltd. on 21/02/2021
/92/	Biogas Heating Equipment Maintenance General Contract signed with Qingdao Zhonghai Environmental Engineering Co., Ltd. on 03/04/2021
/93/	Labor Contracts for Inspection
/94/	Annual Purchase and Sales Contract for Disinfection Products signed with Hunan Kunyuan Biotechnology Co., Ltd. on 24/04/2021
/95/	Publicly available information on the price of retrofitting heating systems in swine farms: https://www.zknrghj.com/vip_doc/17789090.html

/96/	Coal Prices in Gansu Province http://www.coalresource.com/news/4620134/info
/97/	Arthur P M A, Konaté Y, Sawadogo B, et al. Evaluating the Potential of Renewable Energy Sources in a Full-Scale Upflow Anaerobic Sludge Blanket Reactor Treating Municipal Wastewater in Ghana[J]. Sustainability, 2023, 15(4): 3743.
/98/	The public information about the combustion efficiency of biogas boiler: https://www.didanranqiguolu.cn/product/12.html
/99/	The public information about NCV of coal: https://www.zhaibian.com/baike/22460085495136523540.html
/100/	The public information about the combustion efficiency of coal boiler: https://www.didanranqiguolu.cn/product/12.html
/101/	The public information about NCV of coal https://www.zhaibian.com/baike/22460085495136523540.html
/102/	Coal Price Information: http://www.coalresource.com/news/4620134/info
/103/	National Development and Reform Commission on Further Deepening --- Notice on Further Deepening the Market-based Reform of Feed-in Tariffs for Coal-fired Power Generation: https://www.ndrc.gov.cn/xxgk/zcfb/tz/202110/t20211012_1299461_ext.html
/104/	Nutrient requirements of swine (GB/T 39235-2020)

APPENDIX3 COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Mr. Lei ZHANG

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	√	√	√	√	√	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation
	TA 1.2: Energy generation from renewable energy sources
SS 4: Manufacturing industries	TA 4.1: Cement and lime production
SS 13: Waste handling and disposal	TA 13.1: Solid waste and wastewater

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by: Wu Lin

Wu LIN

Technical Competent Manager

Shenzhen, 01/01/2021

Ms. Zhang Wenting

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification					
GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
√	-	-	-	-	-

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by: Wu Lin

Wu LIN

Technical Competent Manager

Shenzhen, 01/03/2022

Ms. Shunrong LIN

Satisfies the requirements of competence management system of CTI Certification, and is hereby appointed as:

Qualification						
Status	GHG Auditor	Validator	Verifier	Team Leader	Technical Reviewer	Technical Expert
Date	√	√	√	√	√	√

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 14: Afforestation and reforestation	TA 14.1: Afforestation and reforestation
SS 15: Agriculture	TA 15.1: Agriculture

This appointment is valid for 3 years from its date of approval below and is bound by internal requirements of management system of the Certification Body of CTI.

Approved by: Wu Lin

Wu LIN

Technical Competent Manager

Shenzhen, 01/01/2021

APPENDIX4 CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS, FORWARD ACTION REQUESTS (CAR/CL/FAR)

Table 1. Remaining FAR from validation and/or previous verification

FAR ID	N/A	**Section no.**	N/A	**Date:**N/A
Description of CL				
N/A				
PP's response				**Date:** N/A
N/A				
Documentation provided by PP				
N/A				
VVB				**Date:** N/A
N/A				

Table 2. CLs from this Project Validation and Verification

CL ID	01	**Section no.**	1.1	**Date:** 04/04/2023
Description of CL				
PP are required to supplement a table in section 1.1 according to the requirement of Joint-PD-MR template v4.2, to clarify the validation and monitoring situation of this project.				
PP's response				**Date:**30/04/2023
the table has added in the section 1.11				

Documentation provided by PP	
Updated Joint-PD-MR	
VVB	**Date:** 09/05/2023
CTI has reviewed the updated Joint-PD-MR and confirmed that PP has supplemented the table as required by Joint-PD-MR template v4.2, and the information on validation and monitoring is accurate. Therefore, CL01 is closed.	

CL ID	02	**Section no.**	1.11	**Date:** 04/04/2023
Description of CL				
The first step in the AWMS process for manure treatment, namely the homogenization process and the equipment involved, is not adequately described in section 1.11 of the Joint-PD-MR. According to the Joint-PD-MR template v4.2, which requires the inclusion of "a list and the arrangement of the main manufacturing/production technologies, systems, and equipment involved," CL01 has been issued for further clarification.				
PP's response				**Date:** 30/04/2023
the list of the homogenization is added in the section 1.11				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
CTI has inspected the updated Joint-PD-MR and the technical agreement/14/, and has confirmed that the information about the homogenization treatment process and the equipment is correct. Therefore, CL02 is closed.				

CL ID	03	**Section no.**	1.16.1	**Date:** 04/04/2023
Description of CL				
PP is not to clarify that how to avoid double counting of the project by considering China has a national emissions trading scheme.				
PP's response				**Date:** 30/04/2023
The project is not included in any emissions trading program or any other mechanism that includes				

GHG allowance trading. The GHG emission reductions and removals generated by the project will not be used for compliance under such programs or mechanisms.

China Emissions Trading Scheme (ETS) has been opened in July 2021. The major industry that includes in ETS is electricity, as well as other seven industries (i.e., oil industry, chemical industry, cement industry, iron and steel industry, non-ferrous metals industry, pulp and paper industry and civil aviation industry). For swine farm manure management doesn't belong to any of the industry mentioned above, the project is not included in China's emission trading system as well.

Besides, the project proponent had signed a declaration of "No Double Counting Statement" and declaration of "Not involved in other GHG scheme" to promise that no double count emissions reductions will appear in this project. Below are excerpts from the declaration.

As the project proponent of the Gansu Hui County Muge Swine Farm Manure Management System GHG Mitigation Project; commit that the emissions generated in the project will not be double counted, and the only emissions reductions generated in the project is under VCS program.

Documentation provided by PP	
Updated Joint-PD-MR	
VVB	**Date:** 09/05/2023

The revised Joint-PD-MR is checked, CTI confirmed that the clarification has been added.

The project proponent is not part of any emission trading program which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website. The net GHG emission reductions during this monitoring period from the project was not used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs which has been confirmed via checking the UNFCCC/67/, GS/69/, VCS/68/ and other GHG schemes' website, it is verified that the implementation of the project is consistent with the description in the Joint-PD-MR and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 01/06/2021 to 31/01/2023 which has been confirmed by checking the Declaration of no double counting and not involved in other GHG scheme/34/.

Besides, based on VVB's local expertise, China has a national emissions trading scheme only cover the high-emission industries, such as eight emission-intensive industries including power generation, petrochemicals, chemicals, building materials, non-ferrous metals, papermaking, steel and aviation that emitted at least 26,000 tons of CO_2e/year which has been verified in the public website/71/, and it is confirmed that the project activity belongs to agriculture sector is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner by checking the enforced company list in public information/72/. On contrary, the project activity can reduce of GHG in the atmosphere through avoiding methane emissions from anaerobic treatment of swine manure and

wastewater. Therefore, it can be concluded that the PP will not be included in the national ETS. Hence, it is confirmed that the emission reductions will not be double counted. Hence, it is confirmed that the emission reductions will not be double counted. CL 03 is closed.

CL ID	04	**Section no.**	2.3	**Date:** 04/04/2023
Description of CL				
The demonstration of environmental impact from the project is not in line with the EIA which analyzed all the potential impacts for both construction and operation period.				
PP's response				**Date:** 30/04/2023
The demonstration of environmental impact from the project including construction and operation period is added in JPM.				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that environmental impacts which analyzed for both construction and operation period is added which is verified as correct and actual by checking the EIA/6/. CL 04 is closed.				

CL ID	05	**Section no.**	3.4	**Date:** 04/04/2023
Description of CL				
Section 3.4 of the Joint-PD-MR lacks convincing evidence and explanations as to explain why "annual fertilizer income," as a variable in the sensitivity analysis, would not cause the IRR to reach the benchmark, thus making it difficult to determine whether the project has additionality. Therefore, CL05 is issued requiring further clarification. Additionally, please provide evidence related to the actual production, sales, and selling price of organic fertilizer during the first monitoring period, to allow CTI to further verify the additionality of this project.				
PP's response				**Date:**30/04/2023
The agreement and the ledger is provided to prove the sale and the sell price of the organic fertilizer				

and the description is add in the JPM ,the IRR has been revised
Documentation provided by PP
Updated Joint-PD-MR Sale agreement of organic fertilizer/28/ The sales records of organic fertilizer covering this monitoring period/29/

VVB	**Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that the clarification has been added. CTI validated via the IRR calculation table that when the annual organic fertilizer sales volume of organic fertilizer increases by 9.75%, the internal rate of return would reach the baseline value. However, upon reviewing the PER/5/, CTI affirmed that the sales of organic fertilizer is determined by the manure from the swine farm and fertilizer price. Moreover, by examining the pigsty construction contract/12/, the actual stocking data from 01/06/2021 to 31/01/2023/24/, and the on-site visit with the PP, it was confirmed that the stock data of breeding swine and market swine in the PER represent the maximum design capacity of the pigsty. Furthermore, CTI, through the sales records of organic fertilizer from 01/06/2021 to 31/01/2023/29/, confirmed that the actual sales volume of organic fertilizer only accounts for a small portion of the total production of organic fertilizer, with the majority being freely distributed to local villagers. Upon reviewing the sales agreement for organic fertilizer/28/, CTI confirmed that the organic fertilizer is sold to local agricultural companies and local organic fertilizer factories at a fixed price of 340 yuan/ton, which aligns with the estimated price in the PER/5/. Therefore, it is not possible to increase the annual production of organic fertilizer by 9.75% to make the internal rate of return reach the baseline. CL 05 is closed.	

CL ID	06	**Section no.**	6.3	**Date:** 04/04/2023
Description of CL				
According to the template requirement "Describe the process and schedule for obtaining, recording, compiling and analyzing the monitored data and parameters set out in Section 6.2 (Data and Parameters Monitored) above," Section 6.3 of the Joint-PD-MR needs to clarify the specific monitoring plans for the two monitored parameters, "NEX_LT,y" and "Type".				
PP's response				**Date:** 30/04/2023
two monitored parameters, "NEX_LT,y" and "Type" have been add into the JPM				
Documentation provided by PP				
Updated Joint-PD-MR				

VVB	Date: 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that the clarification has been added. And the monitoring plan for both parameters meets the requirements inACM0010 (Version 08). CL06 is closed.	

CL ID	07	Section no.	7.1	Date: 04/04/2023
Description of CL				
In accordance with the template requirements, Section 7.1 of the Joint-PD-MR needs to clarify the accuracy information of all monitoring equipment.				
PP's response				**Date:** 30/04/2023
the accuracy information of all monitoring equipment is added into JPM				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that the clarification has been added. And the the accuracy information of all monitoring equipment is consistent with the calibration report/16/. CL07 is closed.				

CL ID	08	Section no.	7.5	Date: 04/04/2023
Description of CL				
PP stated in section 7.5 that Biogas captured during monitoring period is 7,111,953 m^3, which equals to 81,034 tCO_2e, however, how to derive the value of 81,034 tCO_2 based on 7,111,953 m is not clarified.				
PP's response				**Date:** 30/04/2023
Biogas captured during this monitoring period is 7,111,953.00m^3. The quality of methane is 2,904.44 tCH_4, which can be calculated by the amount of biogas, the density of biogas and the content of methane in this monitoring period. Then the quality of methane multiplied by the global warming potential of CH_4 i.e. 27.9 tCO_2/tCH_4.is the result of 81,034 tCO_2e. Please refer ER sheet, tab "monitoring results" for detail calculation process and final results.				
Documentation provided by PP				

Updated Joint-PD-MR
VVB **Date:** 09/05/2023
The revised Joint-PD-MR is checked, via checking the ER sheet, CTI confirmed that the value is correctly calculated based on amount of biogas, the density of biogas and the content of methane in this monitoring period, thus the final result of 81,034 tCO_2 is verified as reasonable and credible. CL 08 is closed.

Table 3. CARs from this Project Validation and Verification

CAR ID	01	**Section no.**	1.12	**Date:** 04/04/2023
Description of CAR				
The latitude and longitude information in section 1.12 of Joint-PD-MR significantly differs from the project location coordinates in the EIA approval documentation, as well as the coordinates determined by the CTI on-site. Therefore, CAR 01 was raised for correction.				
PP's response				**Date:** 30/04/2023
We have revised the The latitude and longitude information in section 1.12 of Joint-PD-MR				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
CTI confirms that the modified coordinate position is correct by using on-site positioning information. CAR01 is closed.				

CAR ID	02	**Section no.**	1.17	**Date:** 04/04/2023
Description of CAR				
1. The section 1.17 is not in line with the latest Joint-PD-MR template request. 2. PP is requested to demonstrate that a project contributes to at least three SDGs by the end of the first monitoring period, and in each subsequent monitoring period as per the section 3.16 of VCS Standard. 3. As per the JPM template, evidence of the project's SD contributions shall be provided as				

appendices to this report, however, the evidence of the project's SD contributions is missing in Appendices of JPM.
PP's response **Date:** 30/04/2023
1. The section 1.17 is revised as the requirement of the latest JPM Template. 2. For SDG13, in this monitoring period from 01/06/2021 to 31/01/2023, the total amount of GHGs emission reductions are 58,604 tCO_2e. For SDG7, total 7,111,953 m^3 of biogas is generated by the project from 01/06/2021 to 31/01/2023. For SDG 8, in this monitoring period from 01/06/2021 to 31/01/2023, total 10 full-time jobs for local people were created. 3. Evidence of the project's SD contributions is added into appendix of JPM
Documentation provided by PP
Updated Joint-PD-MR
VVB **Date:** 09/05/2023
1. The revised Joint-PD-MR is checked, CTI confirmed that section 1.17 has been updated to the Sustainable Development Contributions which is verified in line with the template. 2. The revised Joint-PD-MR is checked, CTI confirmed that actual project contributes to three SDGs by the end of the first monitoring period has been specified and verified as in line with the section 3.16 of VCS Standard Version 4.3/64/. 3. The revised Joint-PD-MR is checked, CTI confirmed that the related evidence has been added into Appendix 1 of the JPM which is consistent with the evidence shown to VVB during site visit. Refer to section 3.1 of this report for detail assessment. CAR 02 is closed.

CAR ID	03	**Section no.**	2.4	**Date:** 04/04/2023
Description of CAR				
The period of public comments is not consistent with what is shown on the VCS website				
PP's response				**Date:** 30/04/2023
The period of public comments has been revised.				
Documentation provided by PP				
Updated Joint-PD-MR				

VVB	Date: 09/05/2023
CTI confirmed that the public comment period started on 09/01/2023 and ended on 08/02/2023 by VCS website (https://registry.verra.org/app/projectDetail/VCS/3950). CAR03 is closed.	

CAR ID	04	Section no.	3.2	Date: 04/04/2023
Description of CAR				
For the applicability to the methodology, the demonstration of the project to applicable to criteria 1 is not correct as the project does not generate electricity.				
PP's response				**Date:** 30/04/2023
There is a typo. For the project, the biogas captured is used for heat generation, which is corrected in JPM.				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that the typo information has been updated accordingly. Refer to section 3.4.2 of this report for detail assessment. CAR 04 is closed.				

CAR ID	05	Section no.	3.4	Date: 04/04/2023
Description of CAR				
The investment analysis including sensitivity analysis and threshold analysis for scenario 6 is not completed, the cross-check descriptions are missing.				
PP's response				**Date:** 30/04/2023
Sensitivity analysis and threshold analysis for scenario 6 is revised to be complete, please refer Section 3.4.				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that investment analysis including sensitivity				

analysis and threshold analysis for scenario 6 has been further specified. Refer to section 3.4.4 of this report for detail assessment. CAR 05 is closed.

CAR ID	06	**Section no.**	IRR sheet & 3.4	**Date:** 04/04/2023
Description of CAR				
There is an error in the calculation of economic indicators. The sum of all depreciations and the residual value of fixed assets is not consistent with the original value of fixed assets. The depreciation of the fixed assets in this project is calculated based on the depreciation rate, and the value of depreciation as a cash outflow should be the same every year, not 50% of other years in the first year. Therefore, CAR06 is issued.				
PP's response				**Date:** 30/04/2023
There is a typo. The IRR sheet and the IRR analysis in section 3.4 of Joint-PD-MR have been revised.				
Documentation provided by PP				
Updated IRR sheet and Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR and IRR sheet are checked, CTI confirmed that investment analysis including sensitivity analysis and threshold analysis for scenario 6 has been further specified. Refer to section 3.4.4 of this report for detail assessment. CAR 06 is closed.				

CAR ID	07	**Section no.**	4.1	**Date:** 04/04/2023
Description of CAR				
Section 4.1 of the Joint-PD-MR needs to be supplemented according to the requirements of Joint-PD-MR template V4.2 which states "The operation of the project activity(s) during this monitoring period, including any information on events that may impact the GHG emission reductions or removals and monitoring." This supplement should include information related to the emissions reduction during the first monitoring period, such as the actual load rate of the AWMS, actual swine stock, actual volume of manure processed, actual biogas generation, and actual volume of organic fertilizer produced.				
PP's response				**Date:** 30/04/2023
The Section 4.1 of the Joint-PD-MR has been revised with actual load rate of the AWMS, actual swine stock, actual volume of manure processed, actual biogas generation, and actual volume of				

organic fertilizer produced
Documentation provided by PP
Updated IRR sheet and Joint-PD-MR
VVB **Date:** 09/05/2023
The revised Joint-PD-MR is checked, CTI confirmed that the operation of the project during this monitoring period has been further specified. Refer to section 4 of this report for detail assessment. CAR 07 is closed.

CAR ID	08	**Section no.**	5.2, 5.4 and ER sheet	**Date:**04/04/2023
Description of CAR				
In the ex-ante calculation of $PE_{CH4,y}$, the value of $Q_{CH4,y}$ is not consistent with the methane production derived from the annual biogas output mentioned in the EIA. The ex-ante calculation contains the following errors: 1. In the ex-ante calculation of $PE_{CH4,y}$, the value of $Q_{CH4,y}$ is not consistent with the methane production derived from the annual biogas output mentioned in the EIA; 2. The calculation methods for $E_{N2O,D,y}$ and $E_{N2O,ID,y}$ do not comply with the requirements of ACM0010, which states "For subsequent treatment stages, the reduction of the nitrogen during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with nitrogen adjusted for the reduction from the previous treatment stages by multiplying by $(1-R_N)$, where R_N is the relative reduction of nitrogen from the previous stage. The relative reduction $(R_{N)}$ of nitrogen depends on the treatment technology and should be estimated in a conservative manner. Default values for different treatment technologies can be found in appendix 1 (values for TN)". In this project, manure is first homogenized before entering subsequent treatment steps, but the remaining N content in the manure after homogenization is not adjusted using $(1-R_N)$; 3. There is a calculation error in the ex-ante calculation for the value of "$1-R_{VS,1}$". Therefore, CAR07 is issued.				
PP's response				**Date:** 30/04/2023
1. ER sheet has been revised 2. The $(1-R_{N,1})$ have been taken into calculation 3. ER sheet has been revised				

Documentation provided by PP	
Updated ER sheet and Joint-PD-MR	
VVB	**Date:** 09/05/2023
1. The revised Joint-PD-MR and ER sheet are checked, CTI confirmed that $Q_{CH4,y}$ is consistent with the methane production derived from the annual biogas output mentioned in the EIA. 2. The revised Joint-PD-MR and ER sheet are checked, CTI confirmed that the $R_{N,1}$ has been taken into account in the $PE_{N2O,y}$ calculation, see section 3.4.6 for details of the confirmation process. 3. The revised Joint-PD-MR and ER sheet are checked, CTI confirmed that the calculation error of 1-$R_{VS,1}$ has been corrected. CAR 08 is closed.	

CAR ID	09	**Section no.**	7.2	**Date:** 04/04/2023
Description of CAR				
In the actual emission reduction calculation process, the values of the following parameters are inconsistent with those pre-determined: 1. MCF_j with cons. Factor; 2. $W_{default}$; 3. TAM; 4. $EF_{CH4,default}$; 5. 1-$R_{VS,1}$.				
PP's response				**Date:** 30/04/2023
We have revised the JPM with the parameter mentioned above				
Documentation provided by PP				
Updated ER sheet and Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR and ER sheet are checked, CTI confirmed that the values of the above parameters in the actual emissions reduction calculation process have been modified to be consistent with the pre-determined. CAR09 is closed.				

CAR ID	10	Section no.	7.2 & MR-ER	Date: 04/04/2023
Description of CAR				
The monthly and cumulative calculation results of the $PE_{EC,y}$ in the Joint-PD-MR are inconsistent between the actual emission reduction calculation sheet (MR-ER).				
PP's response				**Date:** 30/04/2023
We have revised the JPM to keep in accordance with actual emission reduction calculation sheet MR-ER				
Documentation provided by PP				
Updated Joint-PD-MR				
VVB				**Date:** 09/05/2023
The revised Joint-PD-MR and ER sheet are checked, CTI confirmed that the monthly and cumulative calculation results of the $PE_{EC,y}$ in the Joint-PD-MR are consistent between the actual emission reduction calculation sheet (MR-ER). CAR10 is closed.				

Table 4. FARs from this Project Verification

FAR ID	N/A	Section no.	N/A	Date: N/A
Description of FAR				
N/A				
PP's response				**Date:**
N/A				
Documentation provided by PP				
N/A				
VVB				**Date:**
N/A				

APPENDIX5 VALIDATION OF INVESTMENT ANALYSIS CONSIDERING COAL COST SAVINGS

After reviewing the PER /6/, contracts for the construction and procurement of equipment for the AWMS /9/, contracts for the renovation and procurement of equipment for the swine farm's heating system /91/, annual O&M cost details for AWMS /90/, biogas heating equipment maintenance contracts /92/, inspection labor contracts /93/, and disinfectant purchase contracts /94/, CTI confirms that all input parameters used in the initial investment analysis of the project (as detailed in Section 3.4.4 of this report) are derived from the PER. Notably, the initial investment analysis and the PER did not include data on investment, operational costs, or income related to biogas utilization. This implies that the PP did not consider any income generated from biogas utilization nor the investment and operational costs of the heating system as cash outflows in their initial investment analysis.

The PP recalculated the IRR by including coal-saving income, actual investment in the heating system's renovation, and actual operational costs as inputs. This recalculation is detailed in Annex 2 of the Joint-PD-MR /1/ and the IRR Calculation Table Considering Coal-Saving Income /4/. CTI validated the reasonableness of these new inputs by examining the aforementioned contracts and cost details. It was confirmed by CTI that even when considering the cost savings from biogas utilization, the IRR still remains below the benchmark. The specific verification process is as follows:

Crosscheck of input parameters

CTI validation team compared the values stated in the Joint-PD-MR with values determined in the PER /5/, and was able to confirm that the input values are applied correctly in the Joint-PD-MR.

Item	Unit	Value		Source
Annual organic fertilizers sales	t	5,226.02		PER /5/
Price of organic fertilizers	RMB/t	340		PER /5/
Annual coal saved	t	3,547		Calculated
Unit price of coal	RMB/t	417		Publicly available data /96/
Total static investment	10^4 RMB	580	278.5	PER /5/
			301.5	Heating Equipment Procurement and Installation Contract /91/

O&M cost	10^4 RMB	269.32	159.6	PER /6/
			103.8	contracts /92/-/94/
Operation period	Year	15		PER /5/
Emission reduction	tCO_2e	42,657		PER /5/
VCU Price	RMB/ tCO_2e	10		PER /5/
Residual value rate	/	5%		PER /5/
Operation period	year	15		PER /5/

For the validation process of other parameters, please refer to Section 3.4.4 of this report. The accuracy and suitability of the input values related to biogas utilization for the investment analysis were crosschecked as below:

Total Static Investment for renovation and procurement of equipment for the swine farm's heating system: 301.5 10^4 RMB

Upon reviewing the Heating Equipment Procurement and Installation Contract /90/, it was confirmed that the total contract amount is 301.5 10^4 RMB.

Increased annual O&M costs due to biogas utilization: 103.8 10^4 RMB

By checking the biogas heating equipment maintenance contracts /92/, inspection labor contracts /93/, and disinfectant purchase contracts /94/, as well as conducting an on-site inspection, CTI confirmed that biogas utilization results in an average annual equipment maintenance cost of 550,000 RMB, inspection labor costs of 288,000 RMB, and disinfectant procurement expenses averaging 200,000 RMB per year.

Annual coal saved: 3,547 t

After reviewing PER /5/, CTI confirmed that the annual methane utilization of 29,674.5 m^3 is calculated from the annual biogas usage of 482.59*$10^4 m^3$ multiplied by the 60% methane content of the biogas. After reviewing the public article /97/ and available information on the combustion efficiency of biogas boilers /98/, CTI has confirmed that the Net Calorific Value (NCV) of CH_4 at 35.9MJ/m^3 and the combustion efficiency of 90% for biogas boilers in the Joint-PD-MR are reasonable. Therefore, by calculating, CTI confirmed that the annual heat generation from methane, as calculated in the Joint-PD-MR at 93,554,897.40 MJ, is accurate.

And by reviewing the available information on NCV of coal /101/ and the combustion efficiency of coal boilers /100/, CTI has confirmed that the NCV of coal at 29.307MJ/kg and the combustion efficiency of 90% for biogas boilers are reasonable. Therefore, by calculating, CTI confirmed that the annual coal saved as calculated in the Joint-PD-MR at 3,547 t, is accurate.

Unit price of coal: 417 RMB

Based on the information released by the Gansu Province Development and Reform Commission /102/, CTI confirms that the coal price of 417 RMB/t used in the Joint-PD-MR is reasonable.

Conclusion

In conclusion, based on the information validated, the assessment team confirms that all the input values for investment analysis are in reasonable ranges. In addition, the assessment team was able to confirm that the input parameters used in the financial analysis are reasonable and adequately represent the economic situation of the project. Therefore, the assessment team confirms that the assumptions of investment analysis are appropriate and the financial calculations are correct.

Calculation and comparison of financial indicators

CTI validation team compared the values stated in the PD with values determined in the approved EIA /6/ and the research report on operation and maintenance costs and economic benefits /8/ was able to confirm that the input values are applied correctly in the PD.

Upon reviewing the calculation process for the IRR value in calculation sheet /4/, CTI confirmed that the IRR for the project scenario without carbon revenue, which accounts for cost savings through biogas reuse, stands at 5.42%. This figure is below the benchmark rate of 9.5%. Meanwhile, the IRR for the project with carbon revenue increases to 10.45%, exceeding the benchmark of 9.5%. Consequently, the proposed project is financially viable when carbon revenue is included.

Sensitivity analysis

The sensitivity analysis was demonstrated through two manners:

1) Varying ± 10 % of six critical parameters (total static investment, annual O&M cost, annual fertilizers production, annual fertilizer price, annual coal cost, and annual coal price). The selection is checked as in line with the requirements in Tool of Investment analysis (version 11.0) /59/ of "Only variables, including the total static investment, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation", the Total static investment and annual O&M cost are checked as constitutes more than 20% of total project costs. The selling fertilizer inputs and saving coal costs are checked as accounts for more than 20% of the project revenues.

Via checking the sensitivity analysis for these three critical parameters as provided in JPM and the calculation sheet /4/, CTI has verified the ± 10% variation in the three key parameters, and confirmed that a 10% increase in annual selling fertilizer inputs (annual fertilizers production, annual fertilizer price) would result in an IRR exceeding the benchmark.

CTI validated via the IRR calculation table that when the annual organic fertilizer sales volume of organic fertilizer increases by 9.94%, the IRR of the proposed project would reach the benchmark. However, upon reviewing the PER /5/, CTI affirmed that the sales of organic fertilizer is determined by the manure from the swine farm and fertilizer price. Moreover, by examining the pigsty construction contract /12/, the actual stocking data from 01/06/2021 to 31/01/2023/24/, and the on-site visit with the PP, it was confirmed that the stock data of breeding swine and market

swine in the PER represent the maximum design capacity of the pigsty. Furthermore, CTI, through the sales records of organic fertilizer from 01/06/2021 to 31/01/2023/29/, confirmed that the actual sales volume of organic fertilizer only accounts for a small portion of the total production of organic fertilizer, with the majority being freely distributed to local villagers. Upon reviewing the sales agreement for organic fertilizer/28/, CTI confirmed that the organic fertilizer is sold to local agricultural companies and local organic fertilizer factories at a fixed price of 340 yuan/ton, which aligns with the estimated price in the PER /5/. Therefore, it is not possible to increase the annual production of organic fertilizer by 9.94% to make the IRR reach the benchmark.

2) Threshold analysis by varying the other two parameters to make the IRR reach the benchmark. The threshold analysis of each parameter is assessed individually by the validation team as below,

i. If the Total static investment decreases by 22.89%, the IRR reach the benchmark, however, via checking the price index of investment in fixed asset for China/78/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the Total static investment reducing by 22.89% to make the project becomes economical attractive. In addition, due to the project has been operated during the joint audit process, via checking the Equipment (boilers, solid-liquid separators, flare systems and anaerobic tanks) purchase contracts/8/, CTI confirmed that the actual costs of the main equipment is about 4.6 Million RMB, which is higher than estimated value in PER (2.785 Million RMB)/5/. Upon reviewing the Heating Equipment Procurement and Installation Contract /90/, it was confirmed that the total contract amount is 301.5 10^4 RMB. Therefore, the actual investment has exceeded 580 10^4RMB and cannot be reduced anymore.

ii. If the O&M Costs decrease by 6.3%, the IRR reach the benchmark, however, via checking the PER /5/, CTI confirmed that O&M costs mainly consist of maintenance cost, salary & welfare, insurance of fixed assets, and other cost. Via checking the average monthly wage level in Gansu Province/78/, CTI confirmed that the average monthly wage keeps increasing in past years. Besides, via checking the indices of purchasing price of raw material, power and fuel /78/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the O&M cost reducing by 6.3% to make the IRR reach the benchmark.

iii. Annual coal saved: When the project's IRR reaches the benchmark, the annual coal saving amount needs to increase by 11.94%. Through the confirmation process of the above-mentioned coal saving calculation, this requires an annual increase of 11.94% in the biogas utilization volume. By reviewing the PER /5/, CTI confirmed that the biogas production volume and the concentration of methane in the biogas are all taken from the PER /5/. These are estimated by a third party based on factors such as the water content of swine manure, organic matter content, the manure treatment method of the project, and the manure production volume of the swine farm. And all biogas generated by this project will be utilized. Moreover, CTI confirmed through on-site inspection that the swine farm has already been constructed according to the plan, so it is not possible to raise more swine to produce more biogas.

Unit price of coal: When IRR of the proposed project reaches the benchmark, the unit price of natural coal must be increased by 11.94%. After reviewing the relevant policies of the national government on ensuring a stable supply and price of coal /103/, CTI confirmed that it is not possible for the price of natural gas to increase by 11.94%.

In conclusion, the investment analysis concludes that the project IRR (after tax) will not reach the benchmark of 9.5% and the project activity is unlikely to be financially attractive. Threshold analysis is further proved this. The sensitivity analysis and threshold analysis were reproduced by the validation team and evaluated to be correct. Based above, it can confirm that the financial unattractiveness of the project is robust and thus the scenario 6 is the most economically attractive option and plausible baseline scenario.

Hence the scenario 6 is considered as baseline scenario which is “The manure is disposed in an uncovered anaerobic lagoon”.

Based on the checking the data provided in Joint-PD-MR and above related assessment, it proves that the baseline scenario determined in the Joint-PD-MR is correct and reasonable. Therefore, baseline scenario is identified transparently for the project activity.

The assessment team has reviewed the Joint-PD-MR in line with the applied methodology and methodological tool and CTI confirmed that PP has correctly identified the baseline scenario.