Validation report for
GS4GG project activities

(Gold Standard for the Global Goals)

BASIC INFORMATION	
Title of the project activity	Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province
GS Reference Number	GS 11333
Version number of the validation report	3.0
Completion date of the validation report	08/03/2023
Version number of the PDD to which this report applies	06
Project developer	Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.
Project Representative	The official focal point: Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.
Project Participants and any communities involved	Jiangxi Zhengbang Breeding Co. Ltd (Project owner)
Host Party	P. R. China
Applied methodologies and version number	ACM0010 “GHG emission reductions from manure management systems” (Version 08.0)
Mandatory sectoral scopes linked to the applied methodologies	1 and 13
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Scale of the project activity	☐ Micro scale ☐ Small Scale ☒ Large Scale
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A
Project Cycle	☐ Regular ☒ Retroactive
SDG Impacts	Affordable and Clean Energy (SDG 7)- The amount of electricity generation by capturing

	7.2.1 Renewable energy share in the total final energy consumption	biogas : 40,134 MWh
	Decent Work and Economic Growth (SDG 8)- 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities	Number of full-time jobs created: 18 full-time jobs created including 9 males and 9 females
	Climate Action (SDG 13)- 13.2.1 - Number of countries with nationally determined contributions, long-term strategies, national adaptation plans, strategies as reported in adaptation communications and national communications.	Amount of GHGs emission avoided or sequestered: 282,734 tCO_2e/year
Name of the VVB	VVB Name: Shenzhen CTI International Certification Co., Ltd (CTI)	
Name, position and signature of the approver of the validation report	Li Ziqi Li Ziqi Technical Reviewer/Approver	

SECTION A. Executive summary

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The purpose of the project activity is to install new animal waste management systems by replace the current open anaerobic lagoons with 9 new closed anaerobic digesters to a group of 9 swine farms in Hubei Province, which will treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. An Animal Manure Management System (AWMS) has been installed in each swine farm respectively which treat the manure and wastewater from the 9 swine farms. All the manure and wastewater is collected into waste collecting tanks and then enters the homogenate regulating tank, then pumped into the anaerobic tank after further hydrolyzed, and by adopt Upflow anaerobic Sludge Bed Reactor (UASB) as its anaerobic digester technology, then the biogas generated. The project is expected to produce about 31,354,493 m^3 biogas annually. The biogas produced is captured and then sent to the biogas generator for power generation, one biogas generator is installed in each subsidiary swine farm with total installed capacity of 6MW and the annual electricity production is estimated to be 40,134MWh, the electricity are used by the AWMSs and swine farms and surplus biogas will be destroyed through the flaring system (if any). Then after the solid-liquid separation, fermented sludge from the aerobic composting system is used to produce organic fertilizer, which partly distributed to the surrounding farmers freely and others will be sold out to the market, and wastewater will be treated aerobically and then supplied to the farmers living around free for agriculture irrigation which has been confirmed by site inspection and checking the Feasibility Study Report (FSR) of the project/6/.

The project activity enables 9 swine farms to use new animal waste management systems instead of the open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the swine manure, finally generate the power to swine farms.

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 282,734 tCO_2e per year during the first renewable 5-year crediting period.

Scope of Validation

The scope of the services provided by the Shenzhen CTI International Certification Co., Ltd for the project is to perform validation of the project. The scope of validation is to assess the claims and assumptions made in the project design document (PDD) against the GS4GG criteria, CDM applied methodology and other relevant rules and requirements established for GS4GG project activities.

The project applied under Gold Standard for the Global Goals and the Gold Standard Reference No. is 11333.

The objective of this validation is the review by an independent entity whether the project is compliant with the applicable sections of:

- the Gold Standard for the Global Goals Principles and Requirements/47/,
- the Gold Standard for the Global Goals Safeguarding Principles & Requirements/48/,
- the Gold Standard for the Global Goals Community Services Activity Requirements/49/,
- GS4GG GHG Emissions Reduction & Sequestration Product Requirements/51/
- the Gold Standard for the Global Goals Stakeholder Consultation and Engagement Requirements/50/,
- the applied CDM Methodology ACM0010 “GHG emission reductions from manure management systems” (Version 08.0)/38/,
- Any other decision taken by the Technical Advisory Committee of GS (GS-TAC);
- other relevant rules, including the host country legislation

As per the requirements of the Gold Standard for the Global Goals Principles and Requirements/47/, the validation is based on

- the GS4GG PDD/1/,
- the Emission Reduction Calculation Spreadsheet/2/,
- the NPV and IRR Calculation Spreadsheet/4/,
- further supporting documents made available to the validator as well as
- information collected through performing on-site interviews.

Furthermore, publicly available information, such as the host country legislation, was considered as far as available and required.

Validation Process and Methodology

The validation has been performed as described in the Gold Standard for the Global Goals Principles and Requirements/47/ as below process,

a) Desk review of GS PDD (version 02 dated 27/10/2021)/1/ and the relevant documents submitted by the project developer in context of GS4GG criteria
b) On-site assessment (15/08/2022~18/08/2022) conducting site visit, interview or interactions with the representative of the project developer, chief of the swine farms, local officers and residents
c) Issuance of draft validation report, reporting audit findings with respect to clarifications (CLs) and non-conformities(CARs)
d) Resolution of the raised CARs and CLs, close all findings
e) Issuance of the final validation report
f) Independent technical review of the final validation report and final/revised documentation (e.g., PDD, corresponding ER, NPV and IRR calculation sheets and evidences)
g) Reporting and closure of TR comments/findings and final approval for the decision made
h) Issuance of final validation report to contracted PD (or authorized representatives) and submission of request for design certification, as appropriate.

Conclusion

CTI has performed the validation of the GS PA “Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province ” having GS Ref. Number GS11333. The actual project design are consistent with the PDD which will create estimated emission reduction from the project is 1,413,670 tCO_2e during the first renewable 5-year crediting period.

In CTI’s opinion, PDD, supporting documentation and subsequent follow up actions have provided with sufficient evidence to determine the fulfilment of stated GS4GG criteria. CTI confirmed that each SDG Impacts were estimated correctly on the basis of the approved ACM0010 “GHG emission reductions from manure management systems” (Version 08.0) and the Global Goals Principles and Requirements. Therefore, this is being submitted for request for design certification, as per GS procedures as applicable.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Validation findings
1.	Team Leader & Validator	IR	Du	Wenjun	CTI	√	√	√	√

B.2. Technical reviewer and approver of the validation report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)
1.	Technical reviewer/Approver	IR	Li	Ziqi	CTI

SECTION C. Means of validation

C.1. Desk review

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Desk review of all documents provided by PD and publicly available documents relevant for the validation including Key Project Information & project Design Document (PDD)/1/, Stakeholder Consultation Report (SCR)/3/, applied methodology and applicable tools in particular attention to the project design, baseline, project boundary, additionality and monitoring plan and other relevant supporting documents was conducted by CTI.

The main documents are listed below:

(i) the GS4GG PDD Version 02 dated 27/10/2021/1/,
(ii) the emission reduction calculation spreadsheet related to PDD Version 01 dated 27/10/2021/2/,
(iii) the NPV and IRR calculation spreadsheet related to additionality demonstration Version 01 dated 27/10/2021/4/,
(iv) the Stakeholder Consultation Report (SCR) version 01 dated 19/10/2021/3/.

Other supporting documents, such as publicly available information and background information were also reviewed.

The list of documents reviewed during the validation is provided under Appendix 3 of this report.

C.2. On-site inspection

Duration of on-site inspection: 15/08/2022~18/08/2022				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Opening meeting Interview with Representatives of PD, Project Owner, Swine farms, local residents and officers	Office of Jiangxi Zhengbang Breeding Co. Ltd in Wuhan City, Hubei Province, China	15/08/2022	Du Wenjun
2.	On-site inspection of the 9 swine farms with their AWMSs and Interview with chief and operation staffs of farms and animal manure management systems	9 swine farms and their AWMSs in Hubei Province, P.R. China	15/08/2022~ 18/08/2022	Du Wenjun
3.	Documents check as per the list in Appendix 3 of this report	Office of Jiangxi Zhengbang Breeding Co. Ltd in Hubei Province, China	18/08/2022	Du Wenjun
4.	Findings Summary and discussion with PD	Office of Jiangxi Zhengbang Breeding Co. Ltd in Jingzhou City, Hubei Province, China	18/08/2022	Du Wenjun
5.	Close Meeting and issuance of findings/draft report	Office of Jiangxi Zhengbang Breeding Co. Ltd in Jingzhou City, Hubei Province, China	18/08/2022	Du Wenjun

C.3. Interviews

C.3.1. Interviews with PD, Project Owner, Staffs, Chief from each swine farm, local officers and local residents

No.	**Interviewee**			**Date**	**Subject, Reference Number/ID**	**Team member**
	Last name	**First name**	**Affiliation**			
1.	Shen	Min	Jiangxi Zhengbang Breeding Co. Ltd - Project Owner/ Vice General Manager	15/08/2022	Discussion on project financials, project design and implementation, Main equipment,	Du Wenjun

					Technical parameters, Baseline, Additionality, Project boundary, Monitoring plan, Monitoring devices, SDG impacts, ER calculation, Local legislation to biogas	
2.	Tu	Shulan	Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd./ Project Manager	15/08/2022~ 18/08/2022	Ex-ante and monitoring parameters and SDG parameters, PDD and ER, IRR, NPV editable issues	Du Wenjun
3.	Chan	Yuxue	Yongjiahe Swine Farm /Farm Staff	15/08/2022	Scenario before the project started, Swine genetic source on-farm record keeping Feed supplier Swine weight Sale of Swine Living dates of Swine Daily stock of animals in the farm, discounting dead and discarded animals	Du Wenjun
4.	Song	Aimei	Zhoujiachong Swine Farm / Farm Staff			
5.	Yu	Guang	Jiucaiyuan Swine Farm/ Farm Staff	16/08/2022		
6.	Jia	Yanqing	Gaoshanmiao Swine Farm/ Farm Staff			
7.	Guo	Weidong	Shayang 1st phase Swine Farm/ Farm Staff			
8.	Ma	Fuping	Shayang 2nd phase Swine Farm/ Farm Staff	17/08/2022		
9.	Cui	Jingwei	Ezhou Swine Farm/ Farm Staff			
10.	Xie	Zhiwei	Tuchong Swine Farm/ Farm Staff	18/08/2022		
11.	Han	Yunqing	Sangzihu Swine Farm / Farm Staff			
12.	Si	Mawan	Yongjiahe Swine Farm /AWMS operation staff	15/08/2022	Project implementation Treatment method Main equipment Biogas production Slurry General info of interviewee, name, gender, Age, Education, Location When joined the company? How to obtain this job? What is the main work? What about the working condition? Training provided, Salary level, if satisfied	Du Wenjun
13.	Wang	Zhifang	Zhoujiachong Swine Farm / AWMS operation staff			
14.	Jia	Juanxian	Jiucaiyuan Swine Farm/ AWMS operation staff	16/08/2022		
15.	Liu	Zhenjie	Gaoshanmiao Swine Farm/ AWMS operation staff			
16.	Cui	Hongyu	Shayang 1st phase Swine Farm/ AWMS operation staff			
17.	Feng	Hong	Shayang 2nd phase Swine Farm/ AWMS operation staff	17/08/2022		
18.	Mu	Zengzhi	Ezhou Swine Farm/ AWMS operation staff			

19.	LV	Jinqi	Tuchong Swine Farm/ AWMS operation staff	18/08/2022		
20.	Lu	Quanfu	Sangzihu Swine Farm / AWMS operation staff			
21.	Liu	Xiaolan	Local Stakeholders/ Residents	15/08/2022	Local Stakeholder Consultation issues, SDG impacts Local environment impact	Du Wenjun
22.	Chen	Baian				
23.	Xu	Zhiruo				
24.	Pu	Zhenwen				
25.	Lu	Mengqi		16/08/2022		
26.	Ma	Qinglan				
27.	Ye	Lingli				
28.	Jiang	Yazhi				
29.	Ou	Xiangwen				
30.	Gong	Zhengwen				
31.	Ding	Ningzhen		17/08/2022		
32.	Zhu	Xiuyan				
33.	Gu	Yanyu				
34.	Hao	Shulan				
35.	Li	Tiangong		18/08/2022		
36.	Li	Wenshu				
37.	Lv	Hongjun				
38.	Li	Wenyan				
39.	Li	Hongfei	Bureau of Ecology and Environment in Hubei Province / Section Staff	15/08/2022	Baseline Scenario Local Stakeholder Consultation issues, SDG impacts, Inputs, Grievances mechanism, Local legislation to swine and biogas	Du Wenjun
40.	Wang	Zhen	Bureau of Agriculture and Rural Affairs in Hubei Province / Section Staff			

C.3.2. Type of Questions asked by the team members:

During the site visit, the validator has interviewed representatives from project owner, chief of swine farms, staffs, local officers and residents as above table to confirm that the correctness of the project designed data and information and results reported in the PDD.

The questions asked were basically based on requirements of the GS4GG and PDD description.

1. The representatives from project owner were asked the following questions
    a. General aspects of the project

b. Animal Manure treatment system situation
c. Biogas production
d. Main equipment and monitoring devices
e. Project design
f. Project application and aporoval
g. Involved personnel and responsibilities
h. Implementation of the monitoring plan
i. Project ownership

All the related information has been provided by project owner interviewees which is confirmed as consistent with the PDD description and project design in the FSR/6/ and also verified by site inspection. Refer the main contents in the report for detail assessment of the related information.

2. The chief from each swine farm were asked the following questions;
a. Scenario before the project started,
a. Swine genetic source
b. on-farm record keeping
c. Feed supplier
d. Swine weight
e. Sale of Swine
f. Living dates of Swine
g. Daily stock of animals in the farm, discounting dead and discarded animals

All the related information has been provided by chief from each swine farm which is confirmed as consistent with the PDD description and project design in the FSR/6/ and also verified by site inspection. Refer the main contents in the report for detail assessment of the related information.

3. The staff representatives were asked the following questions:
a. General info of interviewee, name, gender, Age, Education, Location
b. When joined the company?
c. How to obtain this job?
d. What is the main work?
e. What about the working condition?
f. Training provided,
g. Salary level, if satisfied

The feedbacks from staffs are listed as below:

All the staffs including females provided the general information, position including accounting, recording and monitoring, join time, join method, main work, all the staffs agreed that the working condition is well and some trainings were provided and they are satisfied with the salary level.

4. The local officers were asked the following questions:
a. National and local legislation of the project type
b. Baseline scenario of the project
c. Local government's attitude to the project
d. Environmental impacts of the project
e. Environmental protection Measurements of the project
f. Project approval procedure
g. Stakeholder comments

The feedbacks from local officers are listed as below:

All the local officers provided the information which is confirmed as consistent with the PDD description and project design in the FSR/6/ and also verified by checking the approvals/8/. Refer the main contents in the report for detail assessment of the related information.

5. The local residents were asked the following questions:
a. Local stakeholder communication process
b. Stakeholder comments

The feedbacks from local residents are listed as below:

All the local residents provided the information which is confirmed as consistent with the PDD description and SCR/3/. All of them have no negative comments to the project, all support the implementation of the project. Refer the main contents in the report for detail assessment of the related information.

C.4. Sampling approach

N/A

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Key project information assessment	-	-	-
Description of project activity	CL 01 CL 02 CL 03	CAR 01 CAR 02 CAR 03 CAR 04	-
Application and selection of methodologies and standardized baselines	-	-	-
- Selected approved methodology(ies) and methodological tools	-	CAR 05	-
- Application of methodology(ies) and tools	CL 04	-	-
- Project boundary, sources and GHGs	-	CAR 06	-
- Baseline scenario	-	CAR 07 CAR 08	-
- Demonstration of additionality	CL 05	CAR 09	-
- Estimation SDG impacts	CL 06 CL 07 CL 08	CAR 10 CAR 11	-
- Monitoring plan	CL 09 CL 10 CL 11 CL 12 CL 13	CAR 12 CAR 13 CAR 14 CAR 15 CAR 16	-
Start date, crediting period type and duration	CL 14	-	-
Safeguarding principles assessment	-	CAR 17	-
Local stakeholder consultation assessment	-	CAR 18	-
Others (please specify) (Evidences)			-
Total	**14**	**18**	**0**

SECTION D. Validation findings

D.1. Key Project Information assessment

Means of validation	This is an animal manure management system GHG mitigation project by replace the current open anaerobic lagoons with 9 new closed anaerobic digesters to a group of 9 swine farms, then treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons which has been verified as actual by site inspection. The activity requirements applied is Community Services Activities. The project is expected to produce 31,354,493 m^3 biogas annually and the estimated emission reduction from the project is 282,734 tCO_2e per year. As per section 9.1.1 and 9.1.2 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/, the project is a large-scale GS VER project. The proposed project is a retroactive project with the start date of 09/09/2020 and the stakeholder consultation physical meeting was conducted on 18/10/2021. The project applied CDM approved methodology ACM0010 "GHG emission reductions from manure management systems" (Version 08.0). Product Requirements applied is GHG Emissions Reduction & Sequestration.
Findings	No findings were raised
Conclusion	The validation team confirms that the process undertaken to describe the key information of the project is described above. The information of the project is justified from the terms mentioned in Key project information form in PDD which has been assessed by the validation team, and CTI confirms that the GS project activity qualifies the eligibility criteria for GS4GG project activities.

D.2. Description of project activity

Means of validation	A draft PDD was submitted to the validation team by the project developers prior to the start of the validation activities. It is checked that the appropriate form has been used for compiling the PDD as per the Gold Standard for Global Goals Key Project Information & Project Design Document (PDD) Template version 1.2 on 14/10/2020/46/. Further every section has been checked against the GS4GG Principles& Requirements/47/ as below, ***i. Purpose and general description of project*** The purpose of the project activity is to install new animal waste management systems by replace the current open anaerobic lagoons with 9 new closed anaerobic digesters to a group of 9 swine farms in Hubei Province, which will treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. An Animal Manure Management System (AWMS) has been installed in each swine farm respectively which treat the manure and wastewater from the 9 swine farms. All the manure and wastewater is collected into waste collecting tanks and then enters the homogenate regulating tank, then pumped into the anaerobic tank after further hydrolyzed, and by adopt Upflow anaerobic Sludge Bed Reactor (UASB) as its anaerobic digester technology, then the biogas generated. The project is expected to produce 31,354,493 m^3 biogas annually. The biogas produced is captured and then sent to the biogas generator for power generation and used by the AWMSs and swine farms. Then after the solid-liquid separation, fermented sludge from the aerobic composting system including oxygen supplemental high temperature fermentation and secondary fermentation processes is used to produce semi-finished organic fertilizer and wastewater will be treated aerobically and then supplied to the farmers living around free for agriculture irrigation which has been confirmed by site inspection and checking the Feasibility Study Report of the project/6/. The project activity enables 9 swine farms to use new animal waste management systems instead of the open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the swine manure, finally generate the power to swine farms that the power was provided by the Central China Power Grid (CCPG) without the project.

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 baseline emissions associated with electricity generation will not be claimed.

The estimated emission reduction from the project is 282,734 tCO_2e per year during the first renewable 5-year crediting period.

ii. Eligibility of the project under GS

The project activity meets the eligibility criteria of the GS4GG as per section 3.1.1 of GS4GG Principles & Requirements/47/, section 3 of GS4GG Community Services Activity Requirements (Version 1.2)/49/ and section 2 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/ as below demonstration,

Requirements as per GS4GG Principles & Requirements	Assessment for this project
- **Types of Project** **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (a) Eligible projects shall include physical action/implementation on the ground. Pre-identified eligible project types are identified in the Eligibility Principles and Requirements section. **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)** Section 2.1.2 All CSA Projects shall lead to climate change mitigation and/or adaptation by providing or improving access to services/resources at the household or community or institution level. Eligible services include electricity and energy, water and sanitation, waste management, housing, etc. Section 3.1.1 Pre-identified CSA project types are: a) Renewable energy; b) End-use energy efficiency; c) Waste management and handling; d) Water, sanitation and hygiene (WASH). **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 5.1.1 The Following Project types are eligible for issuance of GS VERs or GS CERs: a) Renewable Energy Supply; b) End-Use Energy Efficiency Improvement; c) Waste	Via site inspection, CTI confirmed that the project is to install new animal waste management systems to by replace the current open anaerobic lagoons with 9 new closed anaerobic digesters to a group of 9 swine farms in Hubei Province, which will treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Hence, the emission reduction credits will be avoid methane emissions generated through new animal waste management systems. Thus, the project is eligible under project type (c) "Waste management and handling: All waste management activities that deliver energy or a usable product with sustainable development benefits such as composting, biogas etc." as per the GS4GG 'Community Services Activity-Requirements' version 1.2 /49/. Also the project is eligible under section 5.1.1 (c) "Waste Handling & Disposal: The waste handling and disposal category refers to all waste handling Projects that deliver an energy service or a usable product with sustainable development benefits (e.g. composting)." of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/. Finally via checking the section 4.1.3 of GS4GG Principles & Requirements (Version 1.2)/47/, it stated "A Project type is automatically eligible for Gold Standard Certification if there are Gold Standard approved Activity Requirements and/or Impact Quantification Methodologies associated with it or it's referenced in the Gold Standard Product Requirements", hence, CTI confirmed that the project type is automatically eligible for Gold Standard Certification. Hence, the project satisfied this eligibility requirement.

	Handling & Disposal; d) Land Use and Forests.	
	- Location of Project: **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (b) Projects may be located in any part of the world. **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)** Section 3.1.2 Project Area and Boundary shall be defined in line with the applicable Impact Quantification Methodologies and Product Requirements. **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 3.1.1 Gold Standard VER Projects may be located in any host country or state. However, where host countries or states have mandatory operational schemes to reduce GHG emissions in any form (e.g. cap & trade, carbon tax etc.), Projects shall only be eligible if the Project Developer has either: (a) provided Gold Standard with satisfactory justification that no double counting of emission reductions occur or (b) has committed to retiring eligible units equal to the quantity of Gold Standard VERs. Refer to Annex A of this document.	Via checking the FSR/6/ and on-site inspection, CTI confirmed that the project is located in China which is an eligible host country as defined in section 2.1.6 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/. Furthermore, based on validation team's local expertise, China has a cap & trade scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO_2e/year which has been verified in the public website/56/, and CTI confirmed that the project activity 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/57/. Besides, due to the project has unique identified GPS coordinates, hence, it can't be counted in any other voluntary market or emission reduction mechanism which has been checked by searching these schemes including CDM, CCER, VCS etc. Finally, via checking the Declaration of No Double Counting Statement/22/, CTI confirmed that the emission reductions will not be double counted. In conclusion, CTI verified that Project Developer has provided Gold Standard with satisfactory justification that no double counting of emission reductions occur.
	- Project Area, Project Boundary and Scale: **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (c) The Project Area and Project Boundary shall be defined. Projects may be developed at any scale although certain rules, requirements and limitations may apply under specific Activity Requirements, Impact Quantification	Project boundary has been defined in the PDD according to the applied methodology ACM0010/38/ as the geographical extent of the project boundary includes the site of the AWMS(s), including the flare and power generation equipment and the power/heat source and considers the GHG emissions that come from AWMSs, including the GHGs emissions from the anaerobic digestion, GHG emissions from sludge treatment by aerobic composting and GHG emissions from flaring system in 9 swine farms which is verified by checking the FSR of the project/6/ and on-site inspection.

		Methodologies and Products Requirements. In order to avoid double counting the Project shall not be included in any other voluntary or compliance standards programme unless approved by Gold Standard (for example through dual certification). Also, if the Project Area overlaps with that of another Gold Standard or other voluntary or compliance standard programme of a similar nature, the project shall demonstrate that there is no double counting of impacts at design and performance certification (for example use of similar technology or practices through which the potential arises for double counting or misestimation of impacts amongst projects). **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)** Section 3.1.2 Project Area and Boundary shall be defined in line with the applicable Impact Quantification Methodologies and Product Requirements. The definition of scale is the same for all Projects, except Microscale. **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 3.1.1 Gold Standard VER Projects may be located in any host country or state. However, where host countries or states have mandatory operational schemes to reduce GHG emissions in any form (e.g. cap & trade, carbon tax etc.), Projects shall only be eligible if the Project Developer has either: (a) provided Gold Standard with satisfactory justification that no double counting of emission reductions occur or (b) has committed to retiring eligible units equal to the quantity of Gold	Via checking the FSR of the project/6/ and on-site inspection, CTI confirmed that the project is located in China which is an eligible host country as defined in section 2.1.6 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/. Furthermore, based on validation team's local expertise, China has a cap & trade scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO_2e/year which has been verified in the public website/56/, and CTI confirmed that the project activity 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/57/. Besides, due to the project has unique identified GPS coordinates, hence, it can't be counted in any other voluntary market or emission reduction mechanism which has been checked by searching these schemes including CDM, CCER, VCS etc. Finally, via checking the Declaration of No Double Counting Statement/22/, CTI confirmed that the emission reductions will not be double counted. In conclusion, CTI verified that Project Developer has provided Gold Standard with satisfactory justification that no double counting of emission reductions occur. The estimated emission reduction from the project is 282,734 tCO_2e per year checked by review ER sheet/2/ which is more than 60,000 tCO_2e/yr. As per section 9.1.1 and 9.1.2 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/, the project is a large-scale GS VER project. Finally, CTI confirmed that there are no other similar projects in project area, furthermore, due to the project has unique identified GPS coordinates, thus there is no risk for the double counting and no overlap with that of another Gold Standard or other voluntary or compliance standard programme of a similar nature.	

		Standard VERs. Refer to Annex A of this document. Section 9.1.1 Standard VER Projects may be "large scale", "small scale" (for the applicability of methodologies and tools only) or "microscale". Scale is defined in the relevant Gold Standard Activity Requirements or where these do not exist then per following paragraphs. Section 9.1.2 All Projects exceeding the small-scale thresholds are defined as large scale. Small scale projects are defined in accordance with CDM project standard for project activities, as below; a. Type 1: Renewable energy Projects: maximum output capacity of 15 MW(e) or 45MW (th). b. Type 2: End-use energy efficiency project improvement: activities that reduce energy consumption, on the supply and/or demand side, with a maximum energy saving of 60 GWh per year (or an appropriate equivalent) in any year of the crediting period. In this context, for project activities that improve thermal energy efficiency, the maximum energy saving of 60 GWh(e) per year is equivalent to 180 GWh(th) per year saving. c. Type 3: Other project activities: project involves technologies such Safe Water Supply, Waste management, etc. not included in Type I or Type II that result in GHG emission reductions not exceeding 60,000 ton CO_2e per year in any year of the crediting period.	
		- Host Country Requirements **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (d) Projects shall be in compliance with applicable Host Country's legal, environmental, ecological and social regulations. **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)**	Via checking the FSR of the project/6/ and on-site inspection, CTI confirmed that the project is located in China which is an eligible host country as defined in section 2.1.6 of GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/. Via checking the National *Action Plan for Resource Utilization of Livestock Manure* (2017-2020)/29/ and "Notice on Strengthening the Resource Utilization Plan and Ledger Management of Livestock and Poultry Manure"/31/, CTI confirmed that national sustainable development of animal husbandry focused on reduction of livestock waste, and harmless treatment

		Section 3.1.2 Project Area and Boundary shall be defined in line with the applicable Impact Quantification Methodologies and Product Requirements. **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 3.1.1 VER Projects may be located in any host country or state. However, where host countries or states have mandatory operational schemes to reduce GHG emissions in any form (e.g. cap & trade, carbon tax etc.), Projects shall only be eligible if the Project Developer has either: (a) provided Gold Standard with satisfactory justification that no double counting of emission reductions occur or (b) has committed to retiring eligible units equal to the quantity of Gold Standard VERs. Refer to Annex A of this document.	and resource utilization of the manure and wastewater, while the project is to install new animal waste management systems by replace the current open anaerobic lagoons with 9 new closed anaerobic digesters to a group of 9 swine farms, which will treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. An Animal Manure Management System (AWMS) has been installed in each swine farm respectively which treat the manure and wastewater from the 9 swine farms. All the manure and wastewater is collected into waste collecting tanks and then enters the homogenate regulating tank, then pumped into the anaerobic tank after further hydrolyzed, and by adopt Upflow anaerobic Sludge Bed Reactor (UASB) as its anaerobic digester technology, then the biogas generated The biogas produced is captured and then sent to the biogas generator for power generation and used by the AWMSs and swine farms. The fermented sludge from the aerobic composting system including oxygen supplemental high temperature fermentation and secondary fermentation processes is used to produce semi-finished organic fertilizer and wastewater will be treated aerobically and then supplied to the farmers living around free for agriculture irrigation which has been confirmed by site inspection and checking the Feasibility Study Report of the project/6/. Therefore, CTI confirmed that the project is in compliance with China's legal, environmental, ecological and social regulations. Furthermore, the Environment Impact Assessment (EIA)/7/ of the project has been approved by Department of ecology and environment of Hubei Province verified by checking the EIA approval dated on 26/05/2020/8/. Thus it is concluded that the projects is in compliance with applicable Host Country's legal, environmental, ecological and social regulations and local government supported this project as described in the approval/8/. For the boundary and double counting, refer to above column for detail assessment.
		- Contact Details **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)**	The PP's name, contact details and legal registration details have been checked in the Appendix 2 of the PDD which verified as correct by comparing the business license of PP/5/.

		Section 3.1.1 (e) As part of the Project Documentation the Project Developer shall provide (i) name and (ii) contact details of all Project Participants; AND in case of an organization (iii) the legal registration details and (iv) documentation by the governing jurisdiction that proves that the entity is in good standing (defined as being a legal or other appropriate entity registered in or allowed to operate within the required jurisdiction and with no evidence of insolvency or legal/criminal notices placed against it or any of its Directors). Gold Standard retains the right (at its own discretion) to refuse use of the Standard where reputational concerns are highlighted.	Furthermore, through checking the company information in National Enterprise Credit Information Publicity System/59/, CTI confirmed that PPs are in good standing and legally operated and allowed to operate within the required jurisdiction, the financial health is verified. And by checking the website, CTI confirmed that PPs never have been suspected of insolvency or legal/criminal notices placed against it or any of its Directors.
		- Legal Ownership **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (f) Full and uncontested legal ownership of any Products that are generated under Gold Standard Certification, (for example carbon credits) shall be demonstrated. Where such ownership is transferred from project beneficiaries this must be demonstrated transparently and with full, prior and informed consent (FPIC). Note that for certain Project types there is a requirement for full and uncontested legal land title/tenure to be demonstrated. These are contained within specific Activity or Product Requirements. All projects shall immediately report to Gold Standard any land title/tenure disputes arising. **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)** Section 3.1.4 Projects involving the distribution of a large number of devices for services such as heating, cooking, lighting, power generation, water treatment technology such as water filter, etc. shall provide a clear description of the ownership of the Products that are generated under Gold Standard Certification all along the investment chain. In line with the FPIC requirement, the proofs that	The project was invested by project owner Jiangxi Zhengbang Breeding Co. Ltd only and the swine farms involved all owned by this company, hence the project owner has full and uncontested legal ownership of the credits that will be generated under Gold Standard Certification. Beside, the project is a retroactive project, hence, the PD discussed GS VER ownership with local stakeholders through live stakeholder consultation meeting held on 18/10/2021 which has been verified by checking the Stakeholder Consultation Report/3/. Therefore, it is confirmed that the project owner has the legal ownership of the emission reductions generated by the project activity. This is verified by on site interview with the project owner, local officers and chief of swine farms and CTI confirmed that the legal ownership of the project is uncontested.

		end-users are aware of and willing to give up their rights on Products shall be provided. The transfer of Product ownership shall be discussed during local stakeholder consultations for projects.	
		- Other Rights **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (g) As well as legal title and ownership, the Project Developer shall also demonstrate where required uncontested legal rights and/or permissions concerning changes in use of other resources required to service the Project (for example, access rights, water rights etc.). Any known disputes or contested rights must be declared immediately to Gold Standard by the Project Developer and resolved prior to further project implementation in affected areas.	Since the project is to install new animal waste management systems to a group of 9 swine farms in Hubei Province, which will replace the current open anaerobic lagoons in baseline scenario with 9 new closed anaerobic digesters, and via checking the National *Action Plan for Resource Utilization of Livestock Manure* (2017-2020)/29/, it is confirmed that the project is in line with national regulations. Furtheremore, via checking the regulation "Notice on Strengthening the Resource Utilization Plan and Ledger Management of Livestock and Poultry Manure"/31/, CTI confirmed that the project with utilization and resourceful treatment of the manure waste are encouraged by the local government. Besides, via checking the Licenses for production and operation of the breeding livestock and poultry/9/ for each swine farm, CTI verified that all the swine farms of the project have been approved by the local government which is confirmed as in line with the local regulations. And via site inspection, it is verified that all the manure from the swine farms have been put into the AWMSs as it is prohibited to discharge into any natural water resources without treatment by checking the Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming/69/. In conclusion, the project does not involve any activity that causes alteration of any resource, or contested legal rights and other disputes, therefore the need for acquiring any specific legal right is not applicable.
		- Official Development Assistance (ODA) Declaration **Eligibility Criteria in *GS4GG Principles & Requirements* (Version 1.2)** Section 3.1.1 (h) All Project Developers applying for project activities located in a country named by the OECD Development Assistance Committee's ODA recipient list and seeking Gold	Via checking the ODA declaration signed by the project developer/24/, it is verified that no ODA is provided under the condition that the credits generated by the project will be transferred, either directly or indirectly, to the donor country providing ODA support.

		Standard Certification for carbon credits shall declare the Official Development Assistance (ODA) support. The Project Developer shall follow the GHG Emissions Reduction & Sequestration Product Requirements and submit the declaration at the time of Design Certification. **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 6.1.1 and 6.1.2 Projects are ineligible for carbon crediting under GS4GG if the OFFICIAL DEVELOPMENT ASSISTANCE (ODA) is provided to the project under the condition that the credits generated by the Project will be transferred, either directly or indirectly, to the donor country providing ODA support. The OECD defines ODA as financial flows: a. To developing countries and multilateral institutions; b. Provided by government agencies (e.g., USAID); c. Whose main objective is the economic development and welfare of developing countries; and d. That are concessional in character, conveying a grant element of at least 25%. Project Developer submitting a Project located in a country named by the OECD Development Assistance Committee's ODA recipient list shall sign and submit the ODA Declaration.	
		- **Suppressed Demand** **Eligibility Criteria in *GS4GG Community Services Activity Requirements* (Version 1.2)** Section 3.1.3 Certain Impact Quantification methodologies allow projects to account Suppressed Demand scenario when establishing a baseline. In such cases, the application of Suppressed Demand baseline is limited to Small Scale and Microscale Projects. Where a Suppressed Demand baseline is applied, it is not possible to 'stack' Gold Standard Certified Impact Statements or Products as the definition of the baseline may be contradictory.	CTI confirmed that suppressed demand baseline is not applicable to the project. As per Section 3.1.3 of GS4GG Community Services Activity Requirements (Version 1.2), it can be a large-scale GS VER project.

	- **Eligible Greenhouse Gases** **Eligibility Criteria in *GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)*** Section 4.1.1 Only Carbon Dioxide (CO_2), Methane (CH_4) and/or Nitrous Oxide (N_2O) are eligible for GSVERs or GSCERs, provided Projects comply with all GS4GG Requirements and eligibility criteria.	Via checking the MR/1/, ER sheet/2/ and comparing with applied methodology/38/, CTI verified that project considers the emission reductions of Carbon Dioxide (CO_2), methane (CH_4) and/or Nitrous Oxide (N_2O) for Gold Standard crediting, thus is eligible for Gold Standard crediting.

The validation team therefore concluded project compliance with eligibility requirements in GS4GG Principles & Requirements document (version 1.2)/47/, GS4GG GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/ and GS4GG Community Services Activity Requirements (version 1.2)/49/, hence the project is eligible under GS4GG.

iii. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

Via checking the business license/5/ of project owner (Jiangxi Zhengbang Breeding Co. Ltd) and FSR of the project/6/, CTI confirmed that the project was invested by project owner Jiangxi Zhengbang Breeding Co. Ltd only and the swine farms involved all owned by this company, hence the project owner has full and uncontested legal ownership of the credits that will be generated under Gold Standard Certification.

Therefore, it is confirmed that the project owner has the legal ownership of the emission reductions generated by the project activity. This is verified by on site interview with the project owner, local officers and chief of swine farms and CTI confirmed that the legal ownership of the project is uncontested.

In conclusion, CTI verified that the project does not involve any activity that causes alteration of any resource, or contested legal rights and other disputes, therefore the need for acquiring any specific legal right is not applicable.

iv. Location of project

The project is located in Hubei Province, China. There are 9 subsidiary farms involved in the project which have been confirmed by site inspection with GPS device and verified is correct.

Details of the subsidiary farms location are given in table D-1 below:

Table D-1: Project Location

Item	Project Location		
Host Country	China		
Region:	Hubei Province		
Geographical Coordinates			
Swine farm		**East longitude**	**North latitude**
Yongjiahe swine farm		114°39'41.8"	31°08'39.5"
Zhoujiachong swine farm		114°32'08.5"	31°17'02.0"
Jiucaiyuan swine farm		114°25'22.3"	31°21'37.1"
Gaoshanmiao swine farm		114°26'56.9"	31°21'00.0"
Shayang 1st phase swine farm		112°13'55.0"	30°36'29.0"
Shayang 2nd phase swine farm		112°13'39.0"	30°37'26.0"
Ezhou swine farm		114°46'46.4"	30°23'41.2"
Tuchong swine farm		114°15'08.3"	31°32'22.0"
Sangzihu swine farm		112°30'25.6"	30°16'38.5"

The project location has been clearly provided in section A.2 of the PDD and the detailed coordinates of the 9 swine farms have been provided respectively which have also been verified by site inspection with GPS device and the information is correct.

v. Technologies and/or measures

The information presented in the PDD on the technical design is consistent with the actual implementation of the project activity as confirmed through:

- Review of data and information in FSR/6/, equipment purchase contracts/10/, General contract of engineering construction/11/ and technical agreement of equipment/12/. This was verified with other sources if available.
- An on-site visit has been performed, new closed anaerobic digesters and main equipment have been observed and relevant operation personnel with knowledge of the project were interviewed. If doubts arose, further investigations and additional interviews were conducted.
- Finally, information related to the animal manure management system technologies in China have been used (if available) to confirm the accuracy and completeness of the project description.

The technology employed is environmentally safe and sound as well as state of the art.

Technical features of the animal manure management system are verified as below assessment.

The project is to build new animal waste management systems in 9 existing swine farms/15/, replacing the current open anaerobic lagoons with 9 new closed anaerobic digesters. Via site inspection and checkng the Licenses for production and operation of the breeding livestock and poultry for each swine farm/9/, CTI verified that all the 9 swine farms were put into operation before the implementation of the proposed project, detailed operation start date has been listed in the PDD which are confirmed as actual by checking the Licenses for production and operation of the breeding livestock and poultry for each swine farm/9/.

An Animal Manure Management System(AWMS) has been constructed and installed in each swine farm respectively which treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons which is confirmed by site inspection and checking the FSR of the project/6/.

All the manure and wastewater is collected into waste collecting tanks and then be separated first by Solid-liquid separators. The solid will be treated in aerobic composting system including oxygen supplemental high temperature fermentation and secondary fermentation processes, in the high-temperature fermentation process with supplemental oxygen, the pathogenic micro-organisms and harmful substances are deactivated, and after that compost enters the secondary fermentation, which is conducive to the decomposition of refractory organic compounds into relatively stable organic matters to improve the efficiency of the fertilizer, then semi-finished fertilizer procuded and most of the semi-finished fertilizer produced by this project was loaded

	into a transporter by the electric forklift and sold to organic fertilizer manufacturers. A small part of the semi-finished fertilizer produced by this project was distributed to nearby farmers for freeThe liquid will be treated through anaerobic digestion and the biogas generated during the treatment process will be captured for power generation. if there is surplus biogas, then the biogas will be flared through the flaring system. The sludge produced from anaerobic digestion will be treated through aerobic composting together with the solid, the effluent will be supplied to the farmers living around free for agriculture irrigation. The completely mixed anaerobic reactor has been used in each farm anaerobic digester technologies, 9 swine farms involve 130,976 heads of marketing swine, 226,952 heads of breeding swine which has been confirmed by FSR/6/. The project is estimated to produce 522,575 tons of manure every year/6/ and 31,354,493m^3 of biogas are estimated to produce annually/6/. The biogas produced is captured and then sent to the biogas generator for power generation and used by the AWMSs and swine farms. At the same time, the residual biogas will be flared if there is any surplus biogas. The fermented sludge from the aerobic composting system is used to produce organic fertilizer, the organic fertilizers which partly will be supplied to the farmers living around free and partly others will be sold as fertilizer out to the market. And wastewater will be treated aerobically and then supplied to the farmers living around free for agriculture irrigation which has been confirmed by site inspection and checking the Feasibility Study Report of the project/6/. Via checking the PDD, CTI confirmed that the technical description and technical flow chart are described clearly and actual by checking the Feasibility Study Report of the project/6/, technical flow chart of the project/14/ and site inspection. All the closed anaerobic digesters, waste collecting tanks, solid-liquid separators, completely mixed anaerobic reactor, desulfurization and dehydration system, turnover machines, biogas generators, flares and related auxiliary facilities were newly constructed and installed which has been confirmed by site inspection and checking the related equipment purchase contracts/10/ and General contract of engineering construction/11/. The project start date is 09/09/2020 which has been confirmed by checking the equipment purchase contracts/10/, and was put into operation on 01/01/2021 which has been confirmed by checking the operation log of the project/13/ and record of operation started/16/. Basic technical details of the animal waste management systems are summarized in the table 2 of the PDD, refer to PDD for technical details. Technical data of main equipment have been listed and provided in the PDD, which have been verified by checking the nameplates of equipment taken during site visit/65/, equipment purchase contracts/10/ and technical agreements for equipment/12/ are used for cross-check the above parameters and verified that the reasonable and correct values are listed in the PDD. Via checking the PDD/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 9 swine farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity, which has been confirmed during the site interview with PP and on-site checking the photo of baseline lagoon/18/. Thus it is verified that the baseline scenario is reasonable and correct. And via site inspection and checking the related equipment purchase contracts/10/ and General contract of engineering construction/11/, 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.

	Furthermore, through checking the equipment purchase contracts/10/ and General contract of engineering construction/11/, CTI confirmed that the devices are produced domestic in China and there is no technology transfer occurred. ***vi. Scale of the project*** According to the section 9.1.2 of GHG Emissions Reduction & Sequestration Product Requirements (Version 2.1)/51/, the project introduces new animal waste management systems to treat the manure and wastewater, hence belongs to Type 3: other project activities, and via checking the ER calculation sheet/2/, CTI verified that the annual emission reductions of the project activity are 282,734 tCO_2e, which is more than 60,000 tCO_2e, thus is defined as a large-scale GS VER project. ***vii. Funding sources of project*** Via checking the business license/5/ of Project owner Jiangxi Zhengbang Breeding Co. Ltd and FSR of the project/6/, it is verified that Project owner invested in all the finance of the project, there is no public funding involved. Via checking the ODA declaration/24/, it is verified that no ODA is provided under the condition that the credits generated by the project will be transferred, either directly or indirectly, to the donor country providing ODA support.
Findings	CAR 01, CAR 02, CAR 03, CAR 04 and CL 01, CL 02, CL 03 were raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	CTI confirms; (a) The process undertaken to validate the accuracy and completeness of the project is described above; (b) The project description contained in the PDD/1/ of the proposed GS project activity is accurate and complete; (c) The on-site inspection was conducted by the validation team as described in this report. CTI confirms that the type of proposed GS project activity is automatically eligible for Gold Standard Certification. Moreover, CTI confirms that the description of the proposed GS project activity, as contained in the PDD/1/ sufficiently covers all relevant elements, is accurate and complete and that it provides with a clear understanding of the nature of the proposed GS project activity. The project was described in the PDD in accordance with requirements of Gold Standard for Global Goals Key Project Information & Project Design Document (PDD) Template version 1.2 on 14/10/2020/46/.

D.3. Application and selection of methodologies and standardized baselines

D.3.1. Selected approved methodology(ies) and methodological tools

Means of validation	The PDD employs the approved CDM methodology ACM0010 “GHG emission reductions from manure management systems (Version 08.0)”/38/. The tools applied are listed as below, Tool 02: Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)/39/ Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of power generation (Version 3.0)/40/ Tool 06: Project emissions from flaring (version 04.0)/41/ Tool 08: Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/42/ Tool 14: Project and leakage emissions from anaerobic digesters (Version 02.0)/43/ Tool 24: Common practice (Version 03.1)/44/
Findings	CAR 05 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.

Conclusion	The validation team confirms that the applied methodology and methodological tools are listed completely and reference of UNCCC website have been provided.

D.3.2. Application of methodology(ies) and tools

Means of validation

The applicability condition of the methodology ACM0010 Version 08.0 is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
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.	For this project, 9 sets of new AWMS are installed in 9 existing swine farms in order to treat the manure and wastewater from these swine farms, which avoids methane emissions generated in the baseline uncovered anaerobic lagoons and the biogas generated during the treatment process will be captured for power generation, which result in less GHG emissions.	Via site inspection and checking the FSR/6/, related equipment purchase contracts/10/ and General contract of engineering construction/11/, CTI verified that this project activity is installing 9 sets of new animal waste management systems to treat the manure and wastewater from the 9 existing swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Hence this criteria is applicable for this project activity.
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.	For this project, 9 identical sets of new AWMS are installed in 9 existing swine farms in order to treat the manure and wastewater from these swine farms, which was treated in the baseline uncovered anaerobic lagoons prior to the implementation of the project. The project activity will reduce of GHG in the atmosphere through avoiding methane emissions from anaerobic treatment of swine manure and wastewater.	Via site inspection and checking the FSR/6/, related equipment purchase contracts/10/ and General contract of engineering construction/11/, CTI verified that this project activity is installing 9 sets of new animal waste management systems to treat the manure and wastewater from the 9 existing swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons in 9 swine farms respectively that result in less GHG emissions compared to the existing system. 9 swine farms were existed in the baseline with 9 old open lagoons and all animal waste management systems (AWMSs) are newly built in the project. Hence this criteria is applicable for this project activity.
This methodology is applicable to manure management projects under the following conditions:	(a) This project installs new AWMSs to a group of 9 swine farms in Hubei Province, which are owned by Jiangxi Zhengbang Breeding	(a) Via site inspection and checking the Licenses for production and operation of the breeding livestock and poultry/9/ for each swine farm, and furthermore via checking

		(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 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.	Co. Ltd which is a large national agricultural and livestock enterprise specializing in swine breeding, feed sales and swine slaughtering. All the swine farms of the project had obtained the licenses for production and operation of the breeding livestock and poultry issued by local government and livestock and poultry housing layout in each farm should be reasonable as per the requirement of this license. Therefore, all swine is managed under confined conditions. (b)The swine manure is dumped into open anaerobic lagoons and it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming. (c) The open anaerobic lagoons considered in the baseline scenario are designed for deep storage and has a depth of 3-5 meters in accordance with the" design code for wastewater stabilization ponds (GJJ/T54-93)". (d) The annual average ambient temperature at the site is 16°C, which is higher than 5°C. (e) The minimum retention time of manure waste in the open anaerobic lagoons is not less than 45 days, i.e., at least 60 days in the baseline scenario. (f) The anaerobic tanks of the AWMS in the project case is fully enclosed and have steel layer, which can ensure that no leakage of manure waste into	the public information of the project owner/60/ and based on the local expertise of validation team, CTI confirmed that the project owner is is one of the leading national leading agricultural enterprise with the large-scale of swine farms in China, CTI confirmed that all the livestock population in the 9 swine farms within the project boundary is managed under confined conditions. (b) All the swine manure is dumped into open anaerobic lagoons and are not discharged into natural water resources. This is verified by checking the Licenses for production and operation of the breeding livestock and poultry/9/ and checking the Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming/69/. (c) In the baseline scenario the depth of the open lagoons used for manure management under the baseline scenario is from 3-5 meters higher than 1m. This is verified by checking the photo of baseline lagoon/18/ and verified by checking the national standard "Design code for wastewater stabilization ponds (GJJ/T54-93)"/53/. (d) The annual average temperature of baseline site where anaerobic manure treatment facility is located is 16°C which is higher than 5°C. This is verified by checking the public information of local temperature/61/. (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. This is verified by by interview with chiefs and staffs of the farms. (f) The manure from project will be utilized to produce fertilizer after methane capture, hence there is no

	ground water takes place.	leakage of manure waste into ground water occurred which is confirmed by site inspection and checking the produced fertilizer. Furthermore, via site inspection of the anaerobic tanks, CTI confirmed that the material for the tanks is carbon steel and the tanks are totally enclosed without any leak can be found. Via checking the Technical agreement of anaerobic tank/12/, it is verified that the digester equipped with steel layer on the bottom will not cause leakage of manure waste into ground water. Hence this criteria is applicable for this project activity.
In addition, the applicability conditions included in the tools referred to below apply.	Justification for the choice of the selected tools are shown in the following tables.	Refer to below assessments.

The applicability condition of the Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
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 project activity is designed to install new AWMSs to a group of 9 existing swine farms to treat the manure and wastewater from the 9 existing swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Alternative scenarios, barrier analysis, investment analysis and common practice analysis will be carried out based on Tool 02. Refer to section B.4 and B.5 of the PDD for more details.	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.

The applicability condition of the Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of power generation (version 03.0) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power 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.	The electricity generated by the project was used firstly for the operation of AWMSs normally, then the excess electricity was supplied to the swine farms. Unless no electricity generation for this project, the electricity consumption of the project will be supplied by Central China Power Grid (CCPG), which falls under scenario A of Tool 05 (Version 03.0). Therefore, emissions related to electricity consumption need to be calculated based on Tool 05.	Via site inpection, it is confirmed that Electricity consumed by the project is supplied by Central China Power Grid (CCPG), which 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	This methodological tool is applied for calculating for emission by electricity consumption in project	N/A

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.	activity. So, this criterion is not applicable.	
This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO_2 emissions.	Tool 05 is only used to calculate project emissions of electricity consumption supplied by CCPG (Central China Power Grid). For conservativeness, baseline emissions of captive biogas power generation system are ignored. Only CO_2 emissions will be accounted.	Via checking the ER calculation process, it is confirmed that Tool 05 is only used to calculate project emissions of electricity consumption supplied by CCPG (Central China Power Grid).

The applicability condition of the Tool 06 Project emissions from flaring (version 04.0) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
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 biogas generated during the treatment process will be captured for power generation and the residual biogas will be flared. One opened flare system is constructed in each swine farm; Total 9 flares system are used by the project activity.	The project uses open flare system which has been confirmed by site inspection of the 9 open flares in 9 swine farms. Hence this criteria is applicable for this project activity.
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).	The source of the residual biogas of the project activity is from anaerobic treatment process of the swine manure (biogenic source). As per Feasibility Study Report of the project, methane accounts for 60% of the biogas, which is the highest concentration in the flammable residual 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 FSR/6/. Hence this criteria is applicable for this project activity.
The tool is not applicable to the use of auxiliary fuels and therefore the	No auxiliary fuels will be used by the flaring system. As per Feasibility Study	The project does not use auxiliary fuels which has been

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.	Report of the project, methane accounts for 60% of the biogas. And methane is a kind of flammable gas. Operating specifications were provided by the manufacturer of the flare.	confirmed by site inspection of the project implementation and checking the FSR/6/. Hence this criteria is applicable for this project activity.

The applicability condition of the Tool 08 Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 03.0) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
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.	The amount of biogas collected at the digester will be collected and monitored. Refer to section B.7 of the PDD for more details.	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.
Methodologies where CO_2 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 cost-effective way of monitoring flow of CO_2	The biogas generated during the treatment process including CH_4, H_2S, O_2, CO, CO_2, N_2 and H_2, of which CH_4 is the main component. Therefore, this tool is adopted used for determining the mass flow of a greenhouse gas.	It is confirmed that the biogas generated during the treatment process contains CH_4, H_2S, O_2 CO, CO_2, N_2 and H_2 of which CH_4 is the main component, 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 N_2).	a) Methodological tool" Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is applied in the PDD. b) The mass flow is determined in the monitoring plan of the PDD. c) The flow of the gaseous stream will be measured continuously. d) The gaseous stream is dry, equation (5) and (6) are used to calculate the mass flow of greenhouse gas.	(a) The tool is confirmed applied in the PDD. (b) The mass flow has been determined in the monitoring plan of the PDD. (c) The flow of the gaseous stream will be measured continuously as determined in the monitoring plan of the PDD (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.

The applicability condition of the Tool 14 Project and leakage emissions from anaerobic digesters (Version 02.0) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
The following sources of project emissions are accounted for in this tool: (a) CO_2 emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) CO_2 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.	Electricity will be used during the operation of the anaerobic digester, and the anaerobic digestion process of this project does not involve the use of fossil fuels, meanwhile the biogas generated during the treatment process will be captured for power generation and the residual biogas will be flared if there is any surplus biogas. So, the project meets the (a) (c) and (d).	Sources of project emissions including (a) (c) and (d) which involved in the project implementation have been accounted by checking the ER calculation sheet/2/. Hence 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 project activity will replace the current open anaerobic lagoons with 9 new closed anaerobic digesters. The biogas generated during the treatment process will be captured for power generation. After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer. So leakage emissions is not taken into account.	The biogas generated during the treatment process will be captured for power 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 FSR/6/. 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 they are accounted in the methodologies referring to this tool.	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	N_2O emissions are neglected because these are minor emission sources via checking the applied methodology.

		neglected because these are minor emission sources.	

The applicability condition of the Tool 24 Common practice (Version 03.1) is assessed as follows:

Applicability Criteria as per methodology	Justification from PD	VVB Assessment
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.	Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0) is applied to identify the baseline scenario by the project.	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.
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.	The latest version of Combined tool to identify the baseline scenario and demonstrate additionality is referred by ACM0010 methodology.	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.

Findings	CL 04 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	CTI confirms that; • It has critically assessed each applicability condition listed in the selected methodology and methodological tools and the relevant information contained in the PDD against these criteria. • The selected methodology for the proposed GS project activity is applicable. • The selected methodological tools for the proposed GS project activity are applicable. • The methodology was found to be in accordance with the applicable requirements in GS4GG requirements.

D.3.3. Project boundary, sources and GHGs

Means of validation	The project boundary basically defines the physical and geographical boundary of the project facility and it is well defined in the PDD/1/(section B.3) according to ACM0010 GHG emission reductions from manure management systems (Version 08.0)/38/. Project boundary has been defined in the PDD according to the applied methodology ACM0010/38/ as the geographical extent of the project boundary includes the site of the AWMS(s), including the flare and power generation equipment and the power/heat source and considers the GHG emissions that come from AWMSs, including the GHGs emissions from the anaerobic digestion, GHG emissions from sludge treatment by aerobic composting and GHG emissions from flaring system in 9 swine farms which is verified by checking the FSR of the project/6/ and on-site inspection.

	Via site inspection and checking the FSR/6/ and the technical flow chart in the project site/14/, it is verified that project boundary is clearly defined in the PDD as per the methodology. Emissions sources included in the project boundary have been appropriately included in the PDD. 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.
Findings	CAR 06 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The project boundary is completely determined in the PDD/1/ as per ACM0010 GHG emission reductions from manure management systems (Version 08.0)/38/ and is validated by CTI. Also, according to the site inspection and checking the FSR/6/ and the technical flow chart in the project site/14/, validation team confirmed that the sources and gases that are accounted to be appropriate according to the context of project activity.

D.3.4. Baseline scenario

Means of validation

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

The PDD applies the stepwise approach as given by section 5.2 of the ACM0010/38/ and "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/39/.

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 9 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, PD 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/34/, 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

Alternatives	VVB Assessment
The manure is collected from the pasture/Range/Paddock	Via site inspection, CTI confirmed that swines in this project are bred in confined barns rather than pasture/range/paddock. This alternative is ruled out.
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.
Solid Storage: The manure is disposed by solid storage.	Via site interview with chief and staffs in swine farms, CTI 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.
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, and not suitable for such large-scale swine farms, hence this alternative is not economically attractive.

		This alternative is ruled out.
	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.
	Uncovered anaerobic lagoon	Via site interview with chief and staffs in swine farms and by checking the photo of baseline lagoon/18/, 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" (GB/T 36195-2018)/67/ 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.
	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.
	Anaerobic digester	This is part of the project scenario, which is confirmed as one of the most advanced manure management systems, but need high investment compared to Uncovered anaerobic lagoon. However, Via site inspection, it is confirmed that 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 alternative is realistic for this step.
	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.
	Cattle and Swine deep Bedding, <1month, 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 is counter to achieving economies of scale associated with large animal counts, hence this alternative is not realistic. This alternative is ruled out.
	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.
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.
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.
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.
Poultry manure with litter	Via site inspection, CTI confirmed that only large-scale swine farm involved in the project, no Poultry farm.
Poultry manure without litter	Via site inspection, CTI confirmed that only large-scale swine farm involved in the project, no Poultry farm.
Aerobic treatment	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 to be 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 GS 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 GS project activity”

Step 1b: Consistency with mandatory applicable laws and regulations

Via searching the public website with laws and regulations in Hubei 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, 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”/69/ and “Technical specification for sanitation treatment of livestock and poultry manure”/67/, 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)”/66/ 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 expertises. 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)/39/. Via checking the calculation formula and calculation process of the value of NPV and IRR in the calculation sheet/4/, CTI confirmed that the formula and inputs values are correct and actual by checking the FSR/6/, FSR of the project/6/ and Economic Evaluation Method and Parameter of Construction Projects version 03/54/, thus CTI verified that the calculation results of the NPV for scenario 6 and scenario 8 are correct. Via checking the Feasibility Study Report/6/ and online board meeting minute, CTI confirmed that the Feasibility Study Report which confirmed as including prior consideration of carbon revenue was completed on 16/03/2020, besides, start date of the project is the date on singing the biogas generator purchase agreement/10/, i.e., 09/09/2020 which can be defined as the investment decision date, hence it is verified that the time interval between Feasibility Study Report/6/ and investment decision made by PP is less than 1 year, therefore CTI confirmed that input values from Feasibility Study Report/6/ are valid and applicable at the time of the investment decision. 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, PD has analyzed the IRR value to prove that only get revenues from Gold Standard certification the IRR/4/ 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/4/, CTI confirmed that the formula and inputs values are correct and actual by checking the FSR/6/ and Economic Evaluation Method and Parameter of Construction Projects version 03/54/, thus CTI verified that the calculation results of the IRR for scenario 8 is correct and the final value of IRR of the project scenario without carbon revenue is 5.51% which is lower than the benchmark of 9.5%. Benchmark of 9.5% is confirmed as reasonable by checking the "Financial benchmark rate of return of construction projects" issued by NDRC/55/ which define the financial benchmark of animal industry for Project IRR (after tax) is 9.5% for total investment. Via searching the public information and based on the VVB's local expertise of this type of project, it is verified that benchmark is the value used in line with common practice in the animal industry market thus is acceptable and appropriate. Furthermore, based on the expertise of CTI for assess the NPV value of the project of many CDM cases, CTI confirmed that the NPV discount rate is equal to the sum of the risk-free rate of profit, the risk rate of profit and the inflation rate. And the theoretical empirical value of risk-free rate of profit is typically 3%, the risk rate of profit is generally taken as 3-5% and inflation rate for the last ten years is 2.229%, hence the 9% discount rate used by PD is verified as reasonable and acceptable.

The demonstration from PD as below for the discount rate as stated in the "Methodological tool: Investment Analysis" i.e., tool 27 ver.11.0 has been checked, VVB confirmed that there is no special description about the discount rate as Tool 27" Methodological tool: Investment Analysis" (ver.11.0). Hence, based on the financial principle, VVB verified that the discount rate applied in this project is appropriate. Besides, Benchmark of 9.5% is confirmed as reasonable by checking the "Financial benchmark rate of return of construction projects" issued by NDRC which define the financial benchmark of animal industry for Project IRR (after tax) is 9.5% for total investment.

Via comparing the values used in investment analysis in financial sheet with the FSR, VVB confirmed that all the input values are derived from the FSR. Via checking the Feasibility Study Report and online board meeting minute, CTI confirmed that the Feasibility Study Report which confirmed as including prior consideration of carbon revenue was completed on 16/03/2020, besides, start date of the project is the date on singing the biogas generator purchase agreement, i.e., 09/09/2020 which can be defined as the investment decision date, hence it is verified that the time interval between Feasibility Study Report and investment decision made by PP is less than half year, therefore CTI confirmed that input values from Feasibility Study Report are valid and applicable at the time of the investment decision.

Furthermore, via checking the FSR, CTI confirmed that the report was completed by Hangzhou Energy and Environmental Engineering Co., Ltd. who has the qualification of Environmental engineering (waste water) special project design issued by Ministry of Construction of China, and via checking all the report evaluation standards listed in the FSR, especially for all the financial input values as below assessment, VVB confirmed that all the input values are reasonable.

Parameter	Input values	Source	VVB Assessment
Total static investment	11,599.47*10 ^{4}RMB	Feasibility Study Report, 16/03/2020	The value has been derived from the FSR/6/. The Total static investment of the project is 11,599.47*10^{4}RMB according to FSR including engineering, construction and equipment which is in line with national and local standards. Via checking the Equipment (biogas generator, flare system, turnover machines and anaerobic tanks) purchase contracts/10/ and General contract of engineering construction/11/, CTI confirmed that the actual investment costs of the project is 11,952.26*10^{4}RMB/MW, which is higher than estimated value of 11,599.47*10^{4}RMB in FSR/6/. In addition, the other contracts like service contracts are not included. Moreover, according to the price index of investment in fixed asset for China/62/, it is verified that the Investment Price Index (SIP index) keep rising in past years. So the value from FSR used for IRR calculation is confirmed as reasonable.
O&M cost	1,227.08*10^4 RMB	Feasibility Study	The Annual O&M cost is derived from the FSR/6/.

				Report, 16/03/2020	It encompasses sub-items of Maintenance fee, Salary and welfare, Labor insurance fee, Housing fund, Insurance fee as well as other costs. The maintenance fee is calculated as 4.4% of the Fixed assets. This rate of the maintenance cost is assessed as reasonable by checking the 'Economic Evaluation Method and Parameter of Construction Projects'/54/, which defined the maintenance&repair fee is 5% hence 4.4% of maintenance fee is verified as reasonable. The Salary is annual 60,000 CNY/ person which is confirmed as reasonable by checking the labor contracts with employees/26/. The welfare, labor insurance fee and housing fund is calculated as 14%, 17% and 10% of the annual salary which is confirmed as reasonable by checking the labor contracts with employees/26/ and based on the local expertise of VVB. Furthermore, the Average Wage of Staff and Workers and Related Indices/71/ is cross-checked, it is confirmed that the Related Indices of Average Wage keep rising in Hubei Provice in past years, it is confirmed that the salary, welfare, labor insurance fee and housing fund is reasonable. By considering the increase of Average Wage of Staff and Workers and Related Indices in China/71/ for recent years, it is unlikely that this fee reduced in the whole project lifetime. Insurance fee is calculated as 2.5% of the Fixed assets and Other costs are calculated as 24RMB/t of the Amount of organic fertilizers sales. These fees are considered as not main parts of the O&M cost and the values are confirmed as reasonable by checking the 'Economic Evaluation Method and Parameter of Construction Projects'/54/.
		VAT	17%	Feasibility Study Report, 16/03/2020	The VAT tax rate is derived from the FSR. It is in line with the tax Regulation/72/. In the tax

				regulation, VAT is 17% for the project. This tax rate is verified as the correct rate based on local expertise from validation team.
	Income Tax	25%	Feasibility Study Report, 16/03/2020	The tax rate is derived from the FSR. It is in accordance with the Enterprise Income Tax Law of the People's Republic of China/73/. The applied Income tax Law is effective since 01/01/2008 and edited in Dec 2018. But the income tax of 25% is not changed Hence it is relevant for the Purpose of the income tax determination. This rate is widely used by other projects in China.
	Urban construction tax	7%	Feasibility Study Report, 16/03/2020	The tax rate is derived from the FSR. The tax rate is mandatory and applicable since 1985. According to Law of the People's Republic of China on City Maintenance and Construction Tax (Draft)/74/, the tax rate of 7% is applicable to the project and thus deemed as correct and reasonable. This rate is widely used by other projects in China.
	Education surcharge	5%	Feasibility Study Report, 16/03/2020	The tax rate is derived from the FSR. The tax rate is mandatory and applicable since 2011 in Hubei Province. According to "Notice of Hubei Provincial People's Government on the Imposition of Local Education Surcharges"/75/, the rate of the tax is 5% of VAT. This rate is widely used by other projects in China.
	Operation period	15 years	Feasibility Study Report, 16/03/2020	The lifetime of the project is defined as 15 years in FSR and cross checked from the Technical Agreement/12/ of anaerobic fermentation equipment.
	Annual organic fertilizers sales	108,695 ton/year	Feasibility Study Report, 16/03/2020	The value is derived from FSR. CTI confirmed that the organic fertilizers is determined by the manure of the swine farm. And the population of livestocks and scale of the swine farm will stay stable in the future as confirmed by site inspection and interview with chiefs of farms, besides, sales of organic fertilizers are only part of the total organic fertilizers'

			generation and the price of organic fertilizers is determined by the raw material, production technology, the quality of organic fertilizer and so on which has been verified as correct and reasonable based on the local expertise of the VVB.
Sales price of organic fertilizers	220RMB/ton	Feasibility Study Report, 16/03/2020	The value is derived from FSR. via checking the sale agreement of organic fertilizer/23/, it is confirmed that the organic fertilizer is sold to local organic fertilizer plant with the fixed price i.e. 220 RMB/ton which is same to the estimated value in FSR/6/.
Period of depreciation	15 years	Feasibility Study Report, 16/03/2020	The period of depreciation is defined as 15 years in FSR and cross checked from the Technical Agreement/12/ of anaerobic fermentation equipment.
Ending residual rate	5%	Feasibility Study Report, 16/03/2020	The Residual rate of fixed assets has been derived from the FSR. It is prescribed in the 'Detailed Rules for the Implementation of the Provisional Regulations on Corporate Income Tax of the People's Republic of China'/76/ that the residual value rate of fixed assets for the projects after the issue date should use 5%. Moreover, the 5% residual value of the project activity assets has been included as a cash inflow in the final year at the end of the assessment period.

And by checking the calculation process of the value of IRR in the calculation sheet/4/, CTI confirmed that the value of IRR of the project scenario with carbon revenue is increased to 10.68% 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 PDD and the calculation sheet/4/. The analysis is assessed as follow,

The sensitivity analysis was demonstrated through two manners:

i. 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 Investment analysis (version 11.0)/45/ 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 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 PDD and the calculation sheet/4/, CTI verified that the IRR values are still lower than the benchmark by varying ±10% of three critical parameters.

ii. Threshold analysis by varying the above three parameters to make the IRR reach the benchmark. The threshold analysis of each parameter is assessed individually by the validation team as below,

a) If the Total static investment decreases by 21.76%, the IRR reach the benchmark, however, via checking the price index of investment in fixed asset for China/62/, 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 21.76% to make the project becomes economical attractive.

In addition, due to the project has been operated during the validation process, via checking the Equipment (biogas generator, flare system, turnover machines and anaerobic tanks) purchase contracts/10/ and General contract of engineering construction/11/, CTI confirmed that the actual investment costs of the project is $11,952.26*10^4$RMB/MW, which is higher than estimated value of $11,599.47*10^4$RMB in FSR/6/. In addition, by checking the UNFCCC website, CTI confirmed that there were five similar CDM projects registered in China, including treatment of chicken manure from chicken farms and treatment of manure from cow, which is different with the project that treatment of swine manure. However, these five CDM project is registered almost ten years ago, and the investment environment also has changed, therefore the investment of these CDM project not comparable with project that is constructed in 2020. Besides, there were four GS registered projects and two VCS registered projects (GS11222, GS11238, GS11239, GS11255, VCS2740 and VCS 2741) in China by checking GS and VCS website, the investment per farm of these registered project ranges from $1,305.74*10^4$RMB per farm to $1,397.24 *10^4$RMB per farm, while the investment per farm in this project is $1,328*10^4$RMB which is within the registered project ranges, so the project total static investment is verified as reasonable. Therefore, CTI confirmed that the value in FSR/6/ is reasonable and conservative.

Hence CTI confirmed that the value in FSR/6/ is reasonable and conservative.

b) If the Annual organic fertilizers sales increases by 21.05%, the IRR reach the benchmark, however, via checking the FSR/6/, CTI confirmed that the organic fertilizers is determined by the manure of the swine farm. And the population of livestocks and scale of the swine farm will stay stable in the future as confirmed by site inspection and interview with chiefs of farms, besides, sales of organic fertilizers are only part of the total organic fertilizers' generation and the price of organic fertilizers is determined by the raw material, production technology, the quality of organic fertilizer and so on which has been verified as correct and reasonable based on the local expertise of the VVB. Furthermore, via checking the sale agreement of organic fertilizer/23/, it is confirmed that the organic fertilizer is sold to local organic fertilizer plant with the fixed price i.e. 220 RMB/ton which is same to the estimated value in FSR/6/. In addition, via checking the information of the four GS registered projects (GS11222, GS11238, GS11239 and GS11255) and the two VCS registered projects (VCS2740 and VCS2741) in China by checking GS and VCS website, CTI confirmed that the organic fertilizers price ranges from 220-400 RMB/ton, while the organic fertilizers price of this project is 220 RMB/ton which is within the organic fertilizers price range, so the organic fertilizers price is reasonable. Hence it is not likely to increase of annual organic fertilizers generation by 21.05% to make the IRR reach the benchmark.

c) If the O&M Costs decrease by 35.90%, the IRR reach the benchmark, however, via checking the FSR/6/, CTI confirmed that O&M costs mainly consist of price of raw material, power and fuel, wages for the employees, management fee etc. and via checking the average monthly wage level in Hubei Province/62/, CTI confirmed that the average monthly wage keeps

	increasing in past years. Therefore, it is not likely to implement the project activity with the O&M cost reducing by 35.90% to make the IRR reach the benchmark. In addition, as per the applied methodology, all the parameters mentioned under Para 19 of the applied methodology have been assessed as below, Via site inspection checking the project technical flow, CTI confirmed that the power generated through biogas are all used by the AWMSs and the swine farms and not sold to third party. This can save the power cost. Based on the applied methodology, CTI confirmed that for the project boundary determination, the swine farms do not belong to the project and are not included in the project boundary. And with the project implementation, only sales of organic fertilizers is the revenue source of the project. In addition, via site interview with the representatives from swine farms and project owner, CTI confirmed that the swine farms hand over their manure to the project free of charge and the power generated by the project is also used by the swine farms free of charge so that the financial in the two departments of the company can be balanced. Thus it is confirmed that both the cost of manure raw materials and the revenues from power saving of swine farms not included in investment analysis is verified as reasonable. Furthermore, PD has provided the justification to all the listed parameters in the paragraph 19 of the applied methodology ACM0010 (Version 08.0) in the PDD, which has been assessed by VVB, via checking the Feasibility Study Report and comparing with the requests in the methodology and tool 27, VVB confirmed that PD has made correct decisions for include all the corresponding cost and revenues for IRR/NPV calculation and the values are verified as correct and conservative. 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 baeline scenario which is “The manure is disposed in an uncovered anaerobic lagoon”. Based on the checking the data provided in PDD and above related assessment, it proves that the baseline scenario determined in the section B.4 of the PDD is correct and reasonable. Therefore, baseline scenario is identified transparently for the project activity. The assessment team has reviewed the PDD in line with the applied methodology and methodological tool and CTI confirmed that PD has correctly identified the baseline scenario.
Findings	CAR 07 and CAR 08 were raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The validation team based on the description provided above with regard to the assessment of the requirements confirms that: (a) All the assumptions and data used by the project developers are listed in the PDD/1/, including their references and sources; (b) All documentation used is relevant for establishing the baseline scenario and correctly quoted and interpreted in the PDD; (c) Assumptions and data used in the identification of the baseline scenario are justified appropriately, supported by evidence and can be deemed reasonable; (d) Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD; (e) The approved baseline methodology and guideline has been correctly applied to identify the most plausible baseline scenario and the identified baseline scenario reasonably represents what would occur in the absence of the proposed GS4GG project activity.

	(f) The baseline scenario has been determined according to the applied methodology/38/ and "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/39/. The validation team confirms that it has taken other steps and other sources of information used to cross-check the information contained in the PDD/1/, wherever applicable, as listed above.

D.3.5. Demonstration of additionality

Means of validation	By means of comparison of the PDD with the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/39/, 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 PDD for selection of alternative 1 (a) and 3 (i) as assessed in above section D.3.4. Then for the demonstration of additionality, the below steps are assessed, **1. Prior consideration** As per GS4GG Principle & Requirements version 1.2/47/, the regular cycle projects are exempt from prior consideration of revenue carbon checks. The proposed project activity is a retroactive project. Hence, the assessment is as below, The Feasibility Study Report which confirmed as including prior consideration of carbon revenue was completed on 16/03/2020/6/, besides, the online meeting was conducted on 08/07/2020, when the project proponents determined to apply for Gold Standard certification of this project and the start date of the project was 09/09/2020 (see below assessment). The local stakeholder meeting was postponed due to COVID-19 was prevailing in China. The project has been submitted for review to GS registry on 06/09/2021 which is within one year from the date of project start date of 09/09/2020, thus it is verified that the project satisfies the prior consideration requirement as defined in the GS4GG Principles & Requirements version 1.2, clause 4.1.49 Prior Consideration for retroactive projects. **2. Ongoing Financial Need** Investment analysis assessment has been conducted in above section D.3.4. Hence, as per "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/39/, the Step 4 common practice analysis was conducted for finally demonstrate the additionality is assessed as follows: **Step 4 Common practice analysis** The common practice analysis was checked strictly followed Methodological tool “Common practice” (Version 03.1)/44/. ***Sub-step 4a. The proposed CDM project activity(ies) applies measure(s) that are listed in the definitions section above.*** Via checking the UNFCC website, CDM website, China CER exchange info-platform, GS website, VCS website, VVB confirmed that there are 5 projects that were registered at CDM, 9 projects that were registered at GS, 8 projects that are registered at VCS, total are 22 projects which have been listed by PD in the PDD and checked by VVB. ***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 farms, and 9 swine farms involving 130,976 heads of marketing pigs, 226,952 heads of breeding swine in stock are included, and are estimated to produce 522,575 tons of manure every year. So the range is the projects handle manure from 261,287.5 tons to 783,862.5 tons are considered as similar projects. Based on checking the information of the listed

	identified 22 projects, it is confirmed that 8 project fulfill with this condition (GS11238, GS11239, GS11335, GS11338, VCS 2692, VCS 2691, VCS 2706 and VCS 2741). ***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 Hubei 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 Hubei Province results in the different geothermal resource, thus region selected for common practice is Hubei Province. Hence, the above 8 projects which meet the condition of step 1 has been checked, it is confirmed there is no one located in Hubei Province, so the number of similar projects in this condition(a) are 0. (b) Due to the project installs new AWMSs to treat the manure from 9 existing swine farms, which can avoid methane emissions generated in the baseline uncovered anaerobic lagoons. So based on the Tool 24“Common practice (version03.1), same measures is defined as: Animal Manure Management System And based on the above condition (a), the number of similar projects are 0, Therefore, the number of projects meeting both condition(a) and condition(b) is 0. (c) Due to the project is to treat the manure from the 9 swine farms avoid methane emissions generated in the baseline uncovered anaerobic lagoons through new 9 set of AWMSs. The biogas captured for power generation, which is used for the operation of AWMSs and the 9 swine farms, So based on the Tool 24“Common practice (version03.1), same energy source/fuel and feedstock: Swine Farm. And based on the above condition (a) and (b), the number of similar projects are 0, hence here is still 0. (d) Due to 522,575 tons of animal manure waste can be treated annually and the biogas captured for power generation, hence the similar projects can treat the manure waste and produce electricity should be considered. , And based on the above condition (a) to (c), the number of similar projects are 0, hence here is still 0. (e) Output range: handle manure from 261,287.5 tons to 783,862.5 tons annually And based on the above condition (a) to (d), the number of similar projects are 0, hence here is still 0. (f) Due to the project stared commercial operation on 09/09/2020, hence the similar projects started commercial operation before 09/09/2020 should be considered.

	And based on the above condition (a) to (e), the number of similar projects are 0, hence here is still 0. ***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}.*** Based on above step, the number of similar projects is 0. 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 N_{diff}.*** 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.
Findings	CAR 09 and CL 05 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The validation team confirms that all the documented evidence listed and reviewed during the validation process are found correct and is able to confirm that: a) The carbon revenues were considered necessary in the decision to undertake the project activity; b) All the assumptions and data used by the project developers are listed in the PDD, including their references and sources; c) All underlying assumptions are appropriate and reasonable in context of the project activity; d) The demonstration of additionality has been done using the methodological tools. e) As per the detailed assessment, the additionality of the project activity is justified sufficiently.

D.3.6. Estimation of SDG impacts

Means of validation

PD has selected three SDGs and targets, the demonstration is provided as below,

SDGs	Targets	Validation Opinion
SDG 7 Affordable and Clean Energy Ensure access to affordable, reliable, sustainable and modern energy for all	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix Indicator: 7.2.1 Renewable energy share in the total final energy consumption The project activity is designed to introduce new AWMSs to treat the manure and wastewater from the 9 swine farms. The biogas generated during the anaerobic digestion treatment process will be captured for power generation, the electricity generated are all used by the	Via site inspection, CTI confirmed that the project activity is to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms and biogas generated during the anaerobic digestion treatment process will be captured for power generation, the power generated are all used by the AWMSs and the 9 swine farms, which was imported

	operation of AWMSs and the swine farms, which is supplied by the grid company in baseline scenario. The grid company is dominated by thermal power generation.	from power grid without the project. The project will enable the renewable energy share. Hence validation team confirms the project's contribution to SDG 7.
SDG 8 Decent Work and Economic Growth Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value Indicator: 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities. The project activity will provide job opportunities for all locals during project implementation and monitoring activities irrespective of gender or any other status.	Via on-site interview with employees and checking the record keeping book/25/ against the labor contracts/26/. It is verified that project has provided full-time work to local residents. All employees report having better and more stable position than what they were holding before which has been confirmed during on-site interview. Thus the project will achieve full and productive employment. Hence validation team confirms the project's contribution to SDG 8.
SDG 13 Climate Action Take urgent action to combat climate change and its impacts	13.2 Integrate climate change measures into national policies, strategies and planning Indicator: 13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans, strategies as reported in adaptation communications and national communications. The project activity is designed to install 9 sets of AWMSs to a group of 9 swine farms to treat the manure and wastewater from the 9 existing swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Besides, the project will provide an opportunity for local residents to learn and raise awareness on climate change and mitigation measures on the stakeholder consultation fiscal meeting.	The project reduces GHG emissions due to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms thus avoid methane emissions generated in the baseline uncovered anaerobic lagoons as a result of implementing the project. Hence, the project reduces GHG emission compare to baseline condition thus to combat climate change. Hence validation team confirms the project's contribution to SDG 13.

The validation of selected methodology(ies) or proposed approach for calculating baseline and project outcomes is tabulated as below:

SDGs	Approaches	Validation Opinion
SDG 7 Affordable and Clean Energy	Target: 7.2 By 2030, substantially reduce waste generation through	SDG 7 outcome will be monitored through the parameter The amount of electricity generation by

		prevention, reduction, recycling and reuse Indicator: 7.2.1 Renewable energy share in the total final energy consumption Monitoring Indicator: The amount of electricity generation by capturing biogas (MWh) Baseline outcomes: 0 Project outcomes: For ex ante estimation, The amount of electricity generation by capturing biogas was based on Feasibility Study Report of the project, estimated through number of animal and average excretion factor by animal type. The actual data will be monitored by flow meters. The net impact of SDG 7 = Project outcome of SDG 7- Baseline outcome of SDG 7	capturing biogas which will be monitored by flow meters in the monitoring period. By gathering and analyzing flow meters' recording data, The amount of electricity generation by capturing biogas by the project activity will be determined. Thus validation team confirms selected approach is applicable to calculating the project outcomes.
	SDG 8 Decent Work and Economic Growth	Target: 8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value Indicator: 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities Monitoring Indicator: Number of full-time jobs created Baseline outcomes: 0 Project outcomes: In project situation, the number of jobs created for males and females will be recorded. Source of data is record keeping	SDG 8 outcome will be monitored through the parameter Number of full-time jobs created by checking the Record keeping book/25/ and labor contracts/26. By recording jobs and salaries that have been created through the project for activities, the number of males and females participating in the project related activities. Thus validation team confirms selected approach is applicable to calculating the project outcomes.

	book and it will be cross checked by the labor contracts. Net impact of SDG 8=Project outcome of SDG 8 – Baseline outcome of SDG 8	
SDG 13 Climate Action	13.2 Integrate climate change measures into national policies, strategies and planning Indicator: 13.2.1 Number of countries with nationally determined contributions, long-term strategies, national adaptation plans, strategies as reported in adaptation communications and national communications Monitoring Indicator: Amount of GHGs emission avoided or sequestered Calculation Method: the amount of GHGs emissions avoided or sequestered can be obtained by baseline emission – project emissions – leakage emissions using the formulars from ACM0010 GHG emission reductions from manure management systems (Version 08.0)/38/ Net impact of SDG 13=Project outcome of SDG 13 – Baseline outcome of SDG 13	SDG 13 outcome will be monitored through calculation of Amount of GHGs emission avoided or sequestered by ongoing data collection and storage for ER calculation; and monitoring. By measuring amount of GHGs emission avoided or sequestered, the outcomes of project combat climate change will be determined. Thus validation team confirms selected approach is applicable to calculating the project outcomes. The methodological choices/approaches to estimate the GHG Emission Reduction Values will be assessed in below.

Specific calculation for SDG 13:
Amount of GHGs emission avoided or sequestered will be determined as per the applied methodology. The applied methodology ACM0010 Version 08.0/38/ defines the methodological steps to determine the baseline emissions, project emissions and leakages and emission reductions by the proposed project activity. Amount of GHGs emission avoided or sequestered is equal to the value of emission reductions, which will be calculated as below steps,

Baseline Emissions
Via checking the paragraph 26 of the applied methodology, the baseline emissions BE_y in a year y are calculated as:

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

Where:

	BE_y = Baseline emissions in year y (t CO_2/yr) $BE_{CH4,y}$ = Baseline CH_4 emissions in year y (t CO_2/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 ($BE_{CH4,y}$)** $$BE_{CH4,y} = GWP_{CH4} * D_{CH4} * \sum_{j,LT}(MCF_j * B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_{Bl,j}) \quad (2)$$ Where: $BE_{CH4,y}$ = Baseline CH_4 emissions in year y (t CO_2/yr) GWP_{CH4} = Global Warming Potential (GWP) of CH_4 (t CO_2e/t CH_4) D_{CH4} = Density of CH_4 (t/m^3). 0.00067t/m^3 at room temperature (20℃) and 1am pressure. MCF_j = Annual methane conversion factor (MCF) for the baseline *AWMSj*. IPCC 2006, table 10.17, chapter 10,volume 4. $B_{0,LT}$ = 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. In this project, the baseline manure management system is uncovered anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is 100%. $MS\%_{Bl,j}$ =100% 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 experise of validation 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 PD 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: $$VS_{LT,y} = \left(\frac{W_{site}}{W_{default}}\right) * VS_{default} * nd_y \quad (3)$$ 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 dry-matter 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. For Market swine, since there is no way to trace the daily stock, so the Option 1 is adopted to calculate N_{LT} for Market swine. For Breeding swine, the PP can monitor the daily stock of breeding

swine in a reliable way, discounting dead breeding swine and discarded them from the productive process from the daily stock. So, the Option 2 is adopted to calculate N_{LT} for Breeding swine.

Option 1:

$$N_{LT} = N_{da,LT} * \left(\frac{N_{p,LT}}{365}\right) \quad (4)$$

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:

If the project developer can monitor in a reliable and traceable way the daily stock of animals in the farm, discounting dead animals and animals discarded from the productive process from the daily stock, then the annual average number of animals (N_{LT}) may be calculated as follows:

$$N_{LT} = \frac{\sum_1^{365} N_{AA,LT}}{365} \quad (5)$$

Where:

N_{LT} = Annual average number of animals of type *LT* for the year *y* (number)
$N_{AA,LT}$ = 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)/34/.

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 Hubei 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, chapter10/34/.

(D) MCF_j

As per the applied methodology, the MCF_j values given in table 10.17, chapter 10, volume 4, IPCC 2006 Guidelines/34/ should be used. MCF 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 16°C/61/ and the value of 75% applied is verified as consistent with IPCC/34/.

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 2006/34/.

2. Baseline NO_2 emissions ($BE_{NO2,y}$)

$$\mathrm{BE}_{N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * \left(E_{N2O,D,y} + E_{N2O,ID,y}\right) \quad (6)$$

Where:

$BE_{N2O,y}$ = Annual baseline N_2O emissions in (t CO_2e/yr)
GWP_{N2O} = Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)

$CF_{N2O-N,N}$ = Conversion factor N_2O-N to N_2O (44/28)
$E_{N2O,D,y}$ = Direct N_2O emission in year *y* (kg N_2O-N/year)
$E_{N2O,ID,y}$ = Indirect N_2O emission in year *y* (kg N_2O-N/year)

$$E_{N2O,D,y} = \sum_{j,LT} EF_{N2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_{Bl,j} \quad (7)$$

Where:

$E_{N2O,D,y}$ = Direct N_2O emission in year *y* (kg N_2O-N/yr)
$EF_{N2O,D,j}$ = Direct N_2O emission factor for the treatment system *j* of the manure management system (kg N_2O-N/kg N). (Estimated with site-specific, regional or national data if such data is available, otherwise use default EF_3 from table 10.21, chapter 10, volume 4, in the IPCC 2006 Guidelines for National Greenhouse Gas Inventories). The site-specific, regional or national data are not available, so this project activity adopts default EF_3.
$NEX_{LT,y}$ = Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in Appendix 2
$MS\%_{Bl,j}$ = Fraction of manure handled in system *j* (fraction)
N_{LT} = Annual Average number of animals of type LT for the year *y* estimated as per equation 4 and 5 (number)

$$E_{N2O,ID,y} = \sum_{j,LT} \mathrm{EF_{N2O,ID}} * \mathrm{F_{gasMS,j,LT}} * \mathrm{NEX_{LT,y}} * \mathrm{N_{LT}} * \mathrm{MS\%_{Bl,j}} \quad (8)$$

Where:

$E_{N2O,ID,y}$ = Indirect N_2O emission in year *y* (kg N_2O-N/year)
$EF_{N2O,ID}$ = 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). (Estimated with site-specific, regional or national data if such data is available. Otherwise, default values for EF_4 from table 11.3, chapter 11, volume 4 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories
can be used). The site-specific, regional or national data are not available, so this project activity adopts default EF_4.
$NEX_{LT,y}$ = Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in Appendix 2
$MS\%_{Bl,j}$ = Fraction of manure handled in system *j* (fraction)
$F_{gasMS,j,LT}$ = Default values for nitrogen loss due to volatilisation of NH_3 and NO_X from manure management (fraction)
N_{LT} Annual Average number of animals of type LT for the year *y* estimated as per equation (5) or (6) (number)

Estimation of various variables and parameters for above equations:

(A)Procedure for estimating $NEX_{LT,y}$

As per the Appendix 2 of the applied methodology, two options provided, for this project, neither specific information on Portion of that N intake nor site-specific national or regional data is available. So, the Option 2 is adopted to calculate $NEX_{LT,y}$.

Option 2:

In the absence of availability of project specific information on protein intake, which should be justified in the PDD, 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:

$$NEX_{LT,y} = \frac{W_{site}}{W_{default}} * NEX_{IPCC\ default} \quad (9)$$

Where:

$NEX_{LT,y}$	=	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 $NEX_{IPCC\ default}$

$$NEX_{IPCC\ default} = N_{rate(T)} * \frac{TAM}{1000} * 365 \quad (10)$$

Where:

$N_{rate(T)}$	=	the default N excretion rate, kg N/ (1000 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 emission from electricity and/or heat used in the baseline

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

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 power generation in year *y* (t CO_2/yr)
$BE_{HG,y}$	=	Baseline emissions associated with power generation in year *y* (t CO_2/yr)

Via site inspection and checking the baseline scenario evidence/18/, CTI confirmed that baseline scenario of this project is uncovered anaerobic lagoon, and no heat used in the baseline, only minor electricity will be used, so the emission can be excluded for simplification. In addition, the biogas generated during the treatment process in this project will be captured for power generation which used by the 9 swine farms and surplus biogas will be destroyed through the flaring system. The electricity generated will not be connected to another user or to the regional power grid. So, the baseline CO_2 emission from electricity and/or heat used in the baseline is 0, which is deemed as conservative.

Project Emissions

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 treatment of biogas liquid in lagoon.

The Project emissions are estimated as follows:

$$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{N2O,y} + PE_{EC/FC,y} \quad (12)$$

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)
$PE_{N2O,y}$	=	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)

i) $PE_{AD,y}$

$PE_{AD,y}$ 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

$$PE_{AD,y} = PE_{EC,y} + PE_{FC,y} + PE_{CH4,y} + PE_{flare,y} \quad (13)$$

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)

a. $PE_{EC,y}$

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

Via site inspection, CTI confirmed that the electricity consumption of the anaerobic digestion system cannot be measured separately from the entire AWMS, so the Project emissions from electricity consumption associated with the anaerobic digester and that is not related to the anaerobic digester will be calculated together. This is conservative.

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

Where:

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

Since the electricity consumption of the anaerobic digestion system cannot be measured separately from the entire AWMS, so the Project emissions from electricity consumption associated with the anaerobic digester and that is not related to the anaerobic digester will be calculated together.

During the monitoring period, the project emissions from electricity consumption will be calculated as above formular. And the electricity consumption sourced from the grid company will be determined through the electricity meters measurement and cross-check with the grid statement.

b. $PE_{FC,y}$

Via site inspection, CTI confirmed that there are no fossil fuels involved in the project for anaerobic digestion process, and all thermal energy used by the project is supplied by the new installed biogas generators, which is utilizing biogas generated during the treatment process in this project for power generation. No other thermal energy from outside source is used for the project. Hence $PE_{FC,y}$=0.

c. $PE_{flare,y}$

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 03.0)/41/

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.

Therefore, option A is adopted to calculate the mass flow of the residual biogas for flaring as per Too 08 "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" (version 03.0)/42/.

As per paragraph 23 of Tool 8:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)", the way to prove that the gaseous stream is dry needs to demonstrate that the temperature of the gaseous stream (T_t) is less than 60ºC (333.15 K) at the flow measurement point. For this project, the flowmeters installed in the outlet of the anaerobic tanks and the temperature of the anaerobic treatment unit of this project is designed as medium temperature i.e. 35~38 ºC. Therefore, the gas temperature measured by the flowmeter does not exceed 60 ºC, it can be demonstrated that the gaseous stream is dry.

The mass flow of greenhouse gas i ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * \upsilon_{i,t,db} * \rho_{i,t} \quad (15)$$

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t} \quad (16)$$

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 (m^3 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 (m^3 gas *i*/m^3 dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas *i*/m^3 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.m^3/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, 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:

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

Where:

$PE_{flare,y}$	=	Project emissions from flaring of the residual gas in year *y* (tCO_2e)
GWP_{CH4}	=	Global warming potential of methane valid for the commitment period (tCO_2e/tCH_4)
$F_{CH4,RG,m}$	=	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:

$$PE_{flare,y} = GWP_{CH4,y} * V_{t,db} * \upsilon_{i,t,db} * \rho_{i,t} * \left(1 - \eta_{flare,m}\right) * 10^{-3} \quad (18)$$

Where:

$V_{t,db}$	=	Volumetric flow of the residual gas for flaring 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 for flaring 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*)

According to FSR/6/, all the biogas generated in the AWMS will be collected for power generation and no biogas will be flared in pre-calculation. In the monitoring period, the project emissions from flaring of biogas will be calculated according to the actual situation.

d. $PE_{CH4,y}$

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)"/43/. 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:

$$PE_{CH4,y} = Q_{CH4,y} * EF_{CH4,default} * GWP_{CH4} \quad (19)$$

Where:

$PE_{CH4,y}$	=	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)

$Q_{CH4,y}$

Due to the project is a large scale, $Q_{CH4,y}$ was determined following step 1 and Option 1 of the applied tool. Below is the formula used for the calculation of $Q_{CH4,y}$.

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)/42/. 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., $Q_{CH4,y} = \sum_{i=1}^{8760} F_{i,t}$.

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

$$F_{i,t} = V_{t,db} * \upsilon_{i,t,db} * \rho_{i,t} \quad (20)$$

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t} \quad (21)$$

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 (m^3 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 (m^3 gas *i*/m^3 dry gas)
$\rho_{i,t}$	=	Density of greenhouse gas *i* in the gaseous stream in time interval *t* (kg gas *i*/m^3 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.m^3/kmol.K)
T_t	=	Temperature of the gaseous stream in time interval *t* (K)

In summary, the final determined Project emission associated with the anaerobic digeste for the project activity is **$PE_{AD,y} = PE_{EC,y} + PE_{CH4,y} + PE_{flare,y}$**

ii). $PE_{Aer,y}$

IPCC guidelines specify emissions from aerobic lagoons as 0.1 per cent of total methane generating potential of the waste processed, which can be used as a default for all types of aerobic AWMS treatment.

$$PE_{Aer,y} = GWP_{CH4} * D_{CH4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^{N}(1 - R_{VS,n})\right] * \sum_{j,LT}(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) + PE_{sl,y} \quad (22)$$

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.

So,

$$PE_{Aer,y} = GWP_{CH4} * D_{CH4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^{N}(1 - R_{VS,n})\right] * \sum_{j,LT}(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (23)$$

Where:

- GWP_{CH4} = 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_{CH4} = 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 above
- $PE_{sl,y}$ = 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)

iii). $PE_{N2O,y}$

$$PE_{N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (E_{N2O,D,y} + E_{N2O,ID,y}) \quad (24)$$

Where:

- $PE_{N2O,y}$ = Project N_2O emissions in year y (t CO_2/yr)
- GWP_{N2O} = Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
- $CF_{N2O-N,N}$ = Conversion factor N_2O-N to N_2O (44/28)
- $E_{N2O,D,y}$ = Direct N_2O emission in year y (kg N_2O-N/year)
- $E_{N2O,ID,y}$ = 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 $PE_{N2O,\ y}$.

Option 1:

$$E_{N2O,D,y} = \sum_{j,LT} EF_{N2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_j \quad (25)$$

Where:

- $E_{N2O,D,y}$ = Direct N_2O emission in year *y* (kg N_2O-N/yr)
- $EF_{N2O,D,j}$ = Direct N_2O emission factor for the treatment system *j* of the manure management system (kg N_2O-N/kg N)

$NEX_{LT,y}$ = Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2

$MS\%_j$ = Fraction of manure handled in system *j* (fraction)

N_{LT} = Annual Average number of animals of type LT for the year *y* estimated as per equation 4 and 5 (number)

$$E_{N2O,ID,y} = \sum_{j,LT} \mathrm{EF_{N2O,ID}} * \mathrm{F_{gasMS,j,LT}} * \mathrm{NEX_{LT,y}} * \mathrm{N_{LT}} * \mathrm{MS\%_j} \quad (26)$$

Where:

$E_{N2O,ID,y}$ = Indirect N_2O emission in year *y* (kg N_2O-N/year)

$EF_{N2O,ID}$ = 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)

$NEX_{LT,y}$ = Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/yr) estimated as described in appendix 2

$MS\%_j$ = Fraction of manure handled in system *j* (fraction)

$F_{gasMS,j,LT}$ = Default values for nitrogen loss due to volatilisation of NH_3 and NO_X from manure management (fraction)

N_{LT} = Annual Average number of animals of type LT for the year *y* estimated as per equation 4 and 5 (number)

iv) $PE_{elec/heat}$

$$PE_{EC/FC,y} = PE_{EC,y} + \sum_{j} PE_{FC,j,y} \quad (27)$$

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 $EC_{PJ,y} = \sum_i CP_{i,y} * 8760$, where $CP_{i,y}$ is the rated capacity (in MW) of electrical equipment i used for the project activity.

$PE_{FC,y}$ = 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 CO_2 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.

Bsides, 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 $PE_{EC,y}$.

The same for the $PE_{FC,y}$, please refer to $PE_{FC,y}$ calculation in above.
Therefore, $PE_{elec/heat}$=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.

$$LE_y = \left(LE_{PJ,N2O,y} - LE_{BL,N2O,y}\right) + \left(LE_{PJ,CH4,y} - LE_{BL,CH4,y}\right) + LE_{AD,y} \quad (28)$$

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 N_2O 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)

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

$$LE_{BL,N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (LE_{N2O,land,y} + LE_{N2O,runoff,y} + LE_{N2O,vol,y}) \quad (29)$$

$$LE_{N2O,land,y} = EF_1 * \prod_{n=1}^{N}\left(1 - R_{N,n}\right) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (30)$$

$$LE_{N2O,runoff,y} = EF_5 * F_{leach} * \prod_{n=1}^{N}\left(1 - R_{N,n}\right) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (31)$$

$$LE_{N2O,vol,y} = EF_4 * \prod_{n=1}^{N}\left(1 - R_{N,n}\right) * F_{gasm} * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (32)$$

Where:

GWP_{N2O}	=	Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)
$CF_{N2O-N,N}$	=	Conversion factor N_2O-N to N_2O (44/28)
$LE_{N2O,land,y}$	=	Leakage N_2O emissions from application of manure waste in year y (kg N_2O-N/year)
$LE_{N2O,runoff,y}$	=	Leakage N_2O emissions due to leaching and run-off in year y (kg N_2O-N/year)
$LE_{N2O,vol,y}$	=	Leakage N_2O emissions due to volatilisation in year y (kg N_2O-N/year)
F_{gasm}	=	Fraction of N lost due to volatilization (fraction)
N_{LT}	=	Annual average number of animals of type LT estimated as per equation 4 and 5 (number)
$NEX_{LT,y}$	=	Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2
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)

$R_{N,n}$ = Nitrogen reduction factor (fraction)

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

$$LE_{PJ,N2O} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (LE_{N2O,land,y} + LE_{N2O,runoff,y} + LE_{N2O,vol,y}) \quad (33)$$

$$LE_{N2O,land,y} = EF_1 * \prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (34)$$

$$LE_{N2O,runoff,y} = EF_5 * F_{leach} * \prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (35)$$

$$LE_{N2O,vol,y} = EF_4 * \prod_{n=1}^{N}(1 - R_{N,n}) * F_{gasm} * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (36)$$

Where:

GWP_{N2O} = Global Warming Potential (GWP) for N_2O (t CO_2e/tN_2O)

$CF_{N2O-N,N}$ = Conversion factor N_2O-N to N_2O (44/28)

$LE_{N2O,land,y}$ = Leakage N_2O emissions from application of manure waste in year y (kg N_2O-N/year)

$LE_{N2O,runoff,y}$ = Leakage N_2O emissions due to leaching and run-off in year y (kg N_2O-N/year)

$LE_{N2O,vol,y}$ = Leakage N_2O emissions due to volatilisation in year y (kg N_2O-N/year)

F_{gasm} = Fraction of N lost due to volatilization (fraction)

N_{LT} = Annual average number of animals of type LT estimated as per equation 4 and 5 (number)

$NEX_{LT,y}$ = Annual average nitrogen excretion per head of a defined livestock population (kg N/animal/year) estimated as described in appendix 2

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)

$R_{N,n}$ = Nitrogen reduction factor (fraction)

It is not possible to measure the quantity of manure applied to land in kg manure/yr (Q_{DM}) and the nitrogen concentration in kg N/kg manure (N_{DM}) in the manure to estimate the total quantity of nitrogen applied to land. In this case, $\prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT}$ does not need to be replaced by $Q_{DM} * N_{DM}$.

iii) 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:

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

$$LE_{PJ,CH4,y} = GWP_{CH4} * D_{CH4} * MCF_d * \left[\prod_{n=1}^{N}(1 - R_{VS,n})\right] * \sum_{j,LT}(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (38)$$

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
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 (m^3CH_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 (MCF_d) assumed to be equal to 1

iV) 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)/43/.

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:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y} \quad (39)$$

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)

After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer. The effluent from the anaerobic digestion will be treated aerobically and then used for agriculture irrigation. So, the Estimation of leakage emissions associated with the anaerobic digester is 0. i.e., $LE_{AD,y}$ =0.

Emission Reduction

The emission reduction ER_y during a given year y is calculated as follow:

$$ER_y = BE_y - PE_y - LE_y \quad (40)$$

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)

Furthermore, as defined in the applied methodology, in estimating emissions reduction for claiming certified emissions reductions, if the calculated CH_4 baseline emissions from anaerobic lagoons are higher than the measured CH_4 generated in the anaerobic digester in the project situation ($Q_{CH4,y}$ in the tool "Project and leakage emissions from anaerobic digesters"), then the latter shall be used to calculate the emissions reduction for claiming certified emissions reductions. Therefore, the actual methane captured from an anaerobic digester shall be compared to the ($BE_{CH4,y}$ - $PE_{AD,y}$ in the tool "Project and leakage emissions from anaerobic digesters") and if found lower, then ($BE_{CH4,y}$ - $PE_{AD,y}$) (which is a component of BE_y -PE_y) in above Equation is replaced by $Q_{CH4,y}$.

Demonstration of Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs is tabulated as below:

Ex Ante Data and Parameters

Parameters	Value	Reference	Assessment by VT
***GWP_{CH4}* – SDG 13** Global Warming Potential of CH_4	28 tCO_2e/tCH_4	IPCC Fifth Assessment Report (AR5)	Confirmed as per the GS requirement and IPCC Fifth Assessment Report/35/ and consistent with the PDD
***GWP_{N2O}* – SDG 13** Global Warming Potential of N_2O	265 tCO_2e/tCH_4	IPCC Fifth Assessment Report (AR5)	Confirmed as per the GS requirement and IPCC Fifth Assessment Report/35/ and consistent with the PDD
D_{CH4} – SDG 13 Density of CH_4	0.00067 t/m^3	ACM0010 Version 08.0	Confirmed as correct for ex ante determination as per the applied methodology/38/
MCF_j – SDG 13 Methane conversion factor for the baseline AWMSj	70.5%	IPCC 2006 table 10.17, chapter 10, volume 4	Confirmed as correct for ex ante determination as per the IPCC/34/. 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 16°C and the value of 75% is applied as reported by IPCC 2006/34/. Therefore, MCF_j value of 70.5% is applied.
$MS\%_{BI,j}$ – SDG 13 Fraction of manure handled in system j in the baseline	100%	In this project, the baseline manure management system is uncovered anaerobic lagoon only. The amount of manure handled by the anaerobic lagoon is 100%.	Confirmed as correct for ex ante determination. The FSR/6/ and baseline evidence/18/ is checked and confirmed.

	$W_{default}$– SDG 13 Default average animal weight of a defined population	$W_{default}$ (Market swine) =28kg $W_{default}$ (Breeding swine) =28kg	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4	Confirmed as correct for ex ante determination as per the IPCC/34/ and the values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
	$VS_{default}$– SDG 13 Default value for the volatile solid excretion per day on a dry-matter basis for a defined livestock population	$VS_{default}$ (Market swine) =0.3 kg-dm/animal/day $VS_{default}$ (Breeding swine) =0.3 kg-dm/animal/day	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4	Confirmed as correct for ex ante determination as per the IPCC/34/ and the values in IPCC 2006 and US-EPA are compared and the lower value from IPCC 2006 is applied.
	$NEX_{IPCC\ default}$ – SDG 13 Default value for the nitrogen excretion per head of a defined livestock population	$NEX_{IPCC\ default}$ (Market swine) =4.29 kg N/animal/year $NEX_{IPCC\ default}$ (Breeding swine) =2.45 kg N/animal/year	Calculated by the equation: $NEX_{IPCC\ default} = N_{rate(T)} * TAM/1000*365$	Confirmed as correct for ex ante determination according to the calculation equation, while $N_{rate(T)}$ and TAM are default value from IPCC 2006.
	$N_{rate(T)}$ – SDG 13 Default N excretion rate	$N_{rate(T)}$ (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}	IPCC 2006 table 10.19, chapter 10, volume 4 used for $NEX_{IPCC\ default}$ calculations as above equation	Confirmed as correct for ex ante determination as per the IPCC/34/.
	TAM – SDG 13 Typical animal mass for livestock category	TAM (Market swine) =28 kg animal^{-1} TAM (Breeding swine) =28 kg animal^{-1}	IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4 used for $NEX_{IPCC\ default}$ calculations as above equation	Confirmed as correct for ex ante determination as per the IPCC/34/.
	$F_{gas\ MS,j,LT}$– SDG 13 Default	$F_{gasMS,j,LT}$, (anaerobic lagoon) : 40%	IPCC 2006 table 10.22, chapter 10, volume 4 due to site	Confirmed as correct for ex ante determination as per the IPCC/34/

values for nitrogen loss due to volatilisation of NH_3 and NO_X from manure management	$F_{gasMS,j,LT}$, (solid storage) : 45%	specific data is unavailable	
$EF_{N2O,D,j}$– SDG 13 Direct N_2O emission factor for the treatment system *j* of the manure management system (kg N_2O-N/kg N)	0 Kg N_2O-N/kg N for anaerobic lagoon and digester 0.01 Kg N_2O-N/kg N for arobic lagoon	IPCC 2006 table 10.21, chapter 10, volume 4 due to site specific data is unavailable	Confirmed as correct for ex ante determination as per the IPCC/34/
$EF_{N2O,ID,j}$– SDG 13 Indirect N_2O emission factor for the treatment system j of the manure management system	0.01 kgN_2O-N/kg NH_3-N and NO_X-N	IPCC 2006 table 11.3, chapter 11, volume 4 due to site specific data is unavailable	Confirmed as correct for ex ante determination as per the IPCC/34/
$EF_{CH4,default}$– SDG 13 Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)	0.05 t CH_4 leaked / t CH_4 produced	Tool 14: "Project and leakage emissions from anaerobic digesters (version 02.0)" for UASB (Upflow Anaerobic Sludge Blanket) type digesters	Confirmed as correct for ex ante determination as per the tool/43/. Via checking the Digester equipment purchase contract/10/, CTI confirmed that the Digester type in the PDD is correct and actual which is identified by manufacturer information.
$R_{VS,n}$– SDG 13 Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)	$R_{VS,n}$, aerobic treatment anaerobic digester: 2%, 45% and 35% for leakage N_2O emission released during project activity	Appendix 1 of methodology ACM0010	Confirmed as correct for ex ante determination as per the Appendix 1 of methodology ACM0010/38/. For proposed project, before the treated manure is applied to the land, it undergoes three stages of homogenization pretreatment, anaerobic fermentation, and aerobic composting. The corresponding RVS of each stage is 2%, 45%, and 35%, respectively. In addition, the leakage calculated based on this

	$R_{VS,n}$, one cell lagoon: 85% for leakage N_2O emission released during baseline scenario		value is more conservative than the 80% of the cover first cell of two lagoon in Appendix 1 of the methodology. 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} is 85% which is the most conservative value. Via checking Appendix 1 of methodology ACM0010/38/, CTI confirmed that 85% is most conservative value for the one cell lagoon in baseline scenario.
$R_{N,n}$– SDG 13 Nitrogen reduction factor	$R_{N,n}$, anaerobic digester(project scenario): 25% $R_{N,n}$, uncovered anaerobic lagoon (baseline scenario): 80%	Appendix 1 of methodology ACM0010	Confirmed as correct for ex ante determination as per the Appendix 1 of methodology ACM0010/38/. The treatment process of this project is an anaerobic-aerobic combined treatment technology. The anaerobic process is carried out in a closed anaerobic fermentation tank, so the treatment process of this project is similar to the covered first cell of two cell lagoon in the applied methodology appendix 1. so, the $R_{N,n}$ is 25% which is the most conservative value. 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.
EF_1, EF_4, EF_5– SDG 13 Emission factor for N_2O emissions from N inputs; from N	EF_1 = 0.010 kg N_2O-N/kg N EF_4 =0.010 kg N_2O-N/(kg NH_3-	IPCC 2006 Guidelines default values are be used, since country specific or region specific data are not available. EF_1 from table 11.1,	Confirmed as correct for ex ante determination as per the IPCC/34/

leaching and runoff; from atmospheric deposition of N on soils and water surfaces	N and NO_X-N EF_5 = 0.0075 kg N_2O-N/kg N	chapter 11, volume 4. EF_4 and EF_5 from table 11.3, chapter 11, volume 4 due to site specific data is unavailable	
F_{gasm}– SDG 13 Fraction of N lost due to volatilization	0.2	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines due to site specific data is unavailable	Confirmed as correct for ex ante determination as per the IPCC/34/
F_{leach}– SDG 13 Fraction of all N added to/mineralised in managed soils in regions where leaching/runoff occurs that is lost through leaching and runoff	0.3	Default values from table 11.3, chapter 11, volume 4 of IPCC 2006 guidelines due to site specific data is unavailable	Confirmed as correct for ex ante determination as per the IPCC/34/
MCF_d – SDG 13 Methane conversion factor for leakage calculation	**1**	Methodology ACM0010 (version 08.0)	Confirmed as correct for ex ante determination as per the applied methodology/38/. Methane conversion factor for leakage calculation assumed to be equal 1.
$EF_{EF,j,y}$ – SDG 13 Emission factor for power generation	0.57205 tCO_2/MWh	China DNA as per the tool "Baseline, project and/or leakage emissions from electricity consumption and monitoring of power generation"	Confirmed as correct for ex ante determination as per the DNA data/33/
R_u – SDG 13 Universal ideal gases constant	8,314 $Pa.m^3$/kmol .K	Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)	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)/42/
MM_i – SDG 13 Molecular mass of greenhouse gas i	16.04 kg/kmol	Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)	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)/42/
$\eta_{flare,m}$– SDG 13 Flare	0%	Tool 06 "Project emissions from flaring (version 04.0)"	Confirmed as correct open flare as per the applied Project emissions

efficiency in minute m			from flaring (version 04.0)"/41/

Demonstration of Ex ante estimation of impacts linked to each of the three SDGs is tabulated as below:

SDGs	Ex ante estimation of impacts	VVB Assessment
SDG 7 Affordable and Clean Energy	Baseline outcomes: 0 Project outcomes: The amount of electricity generation by capturing biogas by the project is 40,134 MWh/year The estimation is calculated through number of animal and average excretion factor by animal type based on FSR/6/. Actual measurements will be monitored by electricity meters.	Baseline outcome confirmed as 0 due to no animal waste management systems was established in the baseline scenario; Project outcome confirmed as The amount of electricity generation by capturing biogas by the project is 40,134 MWh/year which is verified by checking the FSR/6/.
SDG 8 Decent Work and Economic Growth	Baseline outcomes: 0 Project outcomes: 18 full-time jobs are created including 9 males and 9 females The estimation is based on the number of employees that sign the contracts/26/ and record keeping book/25/.	Baseline outcome confirmed as 0 due to no employment creates without project; Project outcome confirmed as 18 full-time jobs including 9 males and 9 females which is verified by checking labor contracts/26/ and record keeping book/25/.
SDG 13 Climate Action	Baseline outcomes: 0 tCO_2 Project outcomes: Amount of GHGs emissions avoided or sequestered is 282,734 tCO_2 While amount of GHGs emissions avoided or sequestered can be obtained by baseline emission – project emissions – leakage emissions	Baseline outcome confirmed as 0 tCO_2 GHGs emissions avoided or sequestered; Project outcome confirmed as Amount of GHGs emissions avoided or sequestered is 282,734 tCO_2 While amount of GHGs emissions avoided or sequestered can be obtained by baseline emission – project emissions – leakage emissions Which listed as below

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: $BE_y = BE_{CH4,y} + BE_{N2O,y} = 440,751\ tCO_2e + 5,268\ tCO_2e = 446,019\ tCO_2e$

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 PDD/1/ and ER sheet/2/ is verified as correct.

Project Emissions

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

$$PE_y = PE_{AD,y} + PE_{Aer,y} + PE_{N2O,y}$$

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

$PE_{AD,y}$= $PE_{EC,y+}$ $PE_{CH4,y}$+$PE_{flare,y}$ =0 tCO_2e +17,647 tCO_2e +0 tCO_2e
=17,647 tCO_2e
$PE_{Aer,y}$= 183 tCO_2e
$PE_{N2O,y}$= 9,878 tCO_2e
Project emission:
PE_y =$PE_{AD,y}$+$PE_{Aer,y}$+$PE_{N2O,y}$
=17,647 tCO_2e +183 tCO_2e + 9,878 tCO_2e
=27,708 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 PDD/1/ and ER sheet/2/ is verified as correct.

Leakage

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

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

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

$LE_{PJ,N2O,y}$=14,076 tCO_2e
$LE_{BL,N2O,y}$=3,754 tCO_2e
$LE_{PJ,CH4,y}$=219,031 tCO_2e
$LE_{BL,CH4,y}$=93,777 tCO_2e
Leakage emission:
LE_y =($LE_{PJ,N2O,y}$ - $LE_{BL,N2O,y}$)+($LE_{PJ,CH4,y}$ - $LE_{BL,CH4,y}$)
=(14,076 tCO_2e - 3,754 tCO_2e) +(219,031 tCO_2e - 93,777 tCO_2e)
=135,577 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 PDD/1/ and ER sheet/2/ is verified as correct.

Emission reductions

ER_y=BE_y-PE_y-LE_y=BE_y-PE_y

Year	1	2	3	4	5	Total
***BE_y* (tCO_2e)**	446,019	446,019	446,019	446,019	446,019	**2,230,095**
***PE_y* (tCO_2e)**	27,708	27,708	27,708	27,708	27,708	**138,540**
***LE_y* (tCO_2e)**	135,577	135,577	135,577	135,577	135,577	**677,885**
***ER_y* (tCO_2e)**	282,734	282,734	282,734	282,734	282,734	**1,413,670**

Based on the above assessment of the ex ante determined values, it is verified that **the annual ex ante determined ERs calculated result is 282,734 tCO_2/yr.**

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

	Demonstration of Summary of annual average ex ante estimates of each SDG impact over the crediting period is tabulated as below:

SDG	Baseline estimate	Project estimate	Net Impact
7	0 MWh of electricity generation by capturing biogas	40,134 MWh of electricity generation by capturing biogas	40,134 MWh of electricity generation by capturing biogas
8	0 full-time jobs created	18 full-time jobs created including 9 male and 9 female	18 full-time jobs created including 9 male and 9 female
13	0 tCO_2e GHGs emissions avoided or sequestered	282,734 tCO_2e of GHGs emissions avoided or sequestered	282,734 tCO_2e of GHGs emissions avoided or sequestered

Findings	CAR 10, CAR 11 and CL 06, CL 07, CL 08 were raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The validation team has cross checked the parameters and values related to the emission reduction and confirmed that justification of the mentioned values is correct.

D.3.7. Monitoring plan

Means of validation

The monitoring plan in the PDD/1/ is correctly applied to the project activity. The monitoring plan has been found to be in compliance with the requirements of the applied methodology/38/ and related tools.

The monitored data and parameters are assessed as below table by validation team, **Data and parameters to be monitored:**

Relevant SDG	Parameter	Monitoring frequency	Assessment
13	$N_{p,LT}$ - Number of animals of type LT produced annually for the year y	Monitored monthly	$N_{p,LT}$ will be monitored by PP monthly by collected for each swine population in all of the pig barns. The number of swine produced in the farm will be recorded manually by the responsible staff monthly. Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals. This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. Therefore, the number of swine produced in the farm can be traced through the electronic ear tag by the technical staff in each farm and obtained by the DCS. The ex-ante value 130,976 heads of marketing swine is derived from Feasibility Study Report/6/. The indirect information (sale records/17/) will be crosschecked as per the request in the applied methodology.
13	$N_{da,LT}$ - Number of days animal of type LT is alive in the	Monitored monthly	$N_{da,LT}$ will be monitored by PP monthly. Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals.

		farm in the year y		This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. Therefore, the days of swine alive in the farm can be traced through the electronic ear tag by the technical staff in each farm and obtained by the DCS. The ex-ante value 180 days is derived from FSR/6/ which is verified as consistent with the number of days for pigs to be slaughtered by existing large-scale breeding groups in China/52/. The indirect information (sale records/17/) will be crosschecked as per the request in the applied methodology.
	13	**$N_{AA,LT}$** - Daily stock of animals in the farm, discounting dead and discarded animals	Monitored Daily	$N_{AA,LT}$ will be monitored by PP daily. The project proponents will monitor the population of breeding swine through the auto device of electronic ear tag, which is connected to the Data Collection System (DCS). Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals. This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. The technicians in farms monitor and record the number of breeding swine through the auto tracking devices of electronic ear tag daily, of which new imported animals are included and dead and discharge animals are excluded. The annual average number of animals ($N_{AA,LT}$) is calculated as an average of the daily stock of breeding swine in the farms without considering dead animals and discarded animals. The ex-ante value 226,952 heads of breeding swine is derived from FSR/6/. The PDD has describes the system for monitoring stock of animals as per the request in the applied methodology/38/.
	13	**W_{site}** - Average animal weight of a defined livestock population at the project site	Monitored monthly	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. 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 68.4kg for marketing swine and 90kg for breeding swine is derived from FSR/6/. The PDD has described the system of random sampling taking into account stratification of each livestock population into a minimum of three weight categories as per the request in the applied methodology/38/.
	13	n_{dy}- Number of days treatment plant was operational in year y	Monitored Daily	n_{dy} will be monitored by PP daily. The ex-ante value 365 days is confirmed as reasonable due to it is expected that the treatment plant operated eveyday.
	13	F_{Aer}- Fraction of volatile solids directed to aerobic treatment	Monitored Annually	F_{Aer} will be determined annually. The ex-ante value 100% is derived from FSR/6/ and 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.
	13	v_f- Biogas flow	Continuously by flow meters and reported cumulatively on weekly basis	v_f will be monitored by flow meters continuously and reported cumulatively on weekly basis by PP. The ex-ante value 31,354,493m^3 of biogas is confirmed derived from FSR/6/. The calibration of flow meters, including the frequency of calibration, should be done in accordance with national standards or requirements. 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 power generation and the residual gas is sent to flare system, therefore the biogas generated from the anaerobic digestion, the amount of biogas used for power generation and the amount of biogas burned will be monitored through the flow meters. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	$EC_{PJ,j,y}$- Quantity of electricity consumed by the proposed project in year y	Continuous measurement and at least monthly recording	$EC_{PJ,j,y}$ will be monitored by electricity meters continuously and at least monthly recording by PP. The ex-ante value 0 MWh is derived from Feasibility Study Report/6/. During the monitoring period, 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.

				The calibration of electricity meters, including the frequency of calibration, should be done in accordance with national standards or requirements. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	$TDL_{j,y}$ - Average technical transmission and distribution losses for providing electricity to source *j* in year *y*	Change once the tool is updated	The value is a default vale of 20% derived from "Baseline, project and/or leakage emissions from electricity consumption and monitoring of power generation" (version 03.0)/40/.
	13	$\mathbf{V_{t,db}}$ - Volumetric flow of the gaseous stream in time interval t on a dry basis	Continuous measurement	$V_{t,db}$ will be monitored by flowmeters continuously. The ex-ante value was estimated according to the amount of manure. Volumetric flow measurement should always refer to the actual pressure and temperature. 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. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	$\mathbf{V_{i,t,db}}$ - Volumetric fraction of greenhouse gas i in a time interval t on a dry basis	Continuous measurement	$V_{i,t,db}$ will be monitored by gas analyzers continuously. The ex-ante value was derived from Feasibility Study Report/6/. Continuous gas analyser operating in dry-basis. Volumetric flow measurement should always refer to the actual pressure and temperature. 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. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	$\mathbf{T_t}$ - Temperature of the gaseous stream in time interval t	Continuous measurement	T_t will be monitored by recordable electronic signal continuously. The temperature Tt(K) is calculated as the equation T(K)=t(°C) +273.15 The ex-ante value was estimated according to the applied methodology.

				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. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	**P_t** - Pressure of the gaseous stream in time interval t	Continuous measurement	P_t will be monitored by by recordable electronic signal continuously. The ex-ante value was estimated according to the applied methodology. 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. CTI confirmed that PDD has described the monitoring requirement in line with the applied methodology.
	13	$\rho_{i,t}$- Density of greenhouse gas i in the gaseous stream in time interval t	N/A	The value used is 0.67 kg/m^3 for ex-ante determination. 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.
	13	**$MS\%_j$** - Fraction of manure handled in system j in project activity	Annually	The value used is 100% and 54% (the number of materials entering the anaerobic system is 100% and the number of materials entering the aerobic system is 54%) for ex-ante derived from Feasibility Study Report/6/. As this parameter is not monitored in the actual operation. so, in the monitoring period, to be conservative, the value of this parameter in the emission reduction calculation is 100% or total $MS\%_j$ in different treatment system is 100%.
	13	**$B_{0,LT}$** - Maximum methane producing potential of the volatile solid generated by animal type *LT*	Annually	The value used is $B_{0,LT}$ (Market swine) =0.29 $B_{0,LT}$ (Breeding swine) =0.29 for ex-ante determination which 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/34/. As this parameter is not monitored in the actual operation. So, in the monitoring period, 0.29 m^{3}CH$_4$/kg -

				dm is still applied which is verified as conservative. The parameter value should be updated upon the latest available public data source in the monitoring period.
	13	**$NEX_{LT,y}$** - Annual average nitrogen excretion per head of a defined livestock population estimated as described in Appendix 2	Annually	The values used are $NEX_{LT,y}$(Market swine) =10.49 $NEX_{LT,y}$ (Breeding swine) =7.88 for ex-ante determination which is derived from the calculation result as per the equation of option 2 in Appendix 2: $NEX_{LT,y} = \frac{W_{site}}{W_{default}} * NEX_{IPCC\ default}$ While, $NEX_{IPCC\ default}$ calculated as equation 30 of the IPCC 2006, volume 4, chapter 10 $NEX_{IPCC\ default} = N_{rate}(T)$* TAM/1000* 365 While $N_{rate(T)}$ and TAM are default value from IPCC 2006 And this value will be monitored annully to checki the updated data from latest available public data source.
	13	**Type -** Type of barn and AWMS	N/A	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 due to all the other parameters monitored can–determine if the project type has been changed or not.
	13	**T -** Annual average ambient temperature at project site	Monthly	The value used is 16°C for ex-ante determination which is derived from official publicly available information/61/. This parameter will be monitored monthly by checking the annual average ambient temperature at project site from official publicly available information monthly. The parameter value should be updated upon the changes occur in the monitoring period.
	8	Number of full-time jobs created	Once for each monitoring period	The value used is 18 full-time jobs including 9 males and 9 females for ex-ante determination as per the Record keeping book/25/ and labor contracts/26/ and interview with project owner about the recruitment plan. It will be monitored once for each monitoring period through the parameter number of jobs created by checking the Record keeping

			books/25/ and labor contracts/26/. By recording jobs that have been created through the project for activities, the number of people participating in the project related activities will be determined. After the first verification, only changes in employees will be reported.
7	**$EG_{d,y}$-** The amount of electricity generation by capturing biogas	Continuous measurement and at least monthly recording	$EG_{d,y}$ will be monitored by electricity meters continuously and at least monthly recording by PP. The ex-ante value 40,134 MWh is derived from Feasibility Study Report/6/. During the monitoring period, the electricity generated from biogas generators, then the value will be determined by the electricity meters monitoring. The calibration of electricity meters, including the frequency of calibration, should be done in accordance with national standards or requirements.
Mitigation Measure for Safeguarding Principles	Employee Training of biogas safety operation	Training once a year	The employees will be trained on the safety operation of the biogas. It will be monitored annually through checking the Training notice/27/ and cross check with the Meeting attendance record/28/. By recording the training on the safety operation of the biogas, the Mitigation Measure for Safeguarding Principles will be determined.

The assessment team has confirmed that the monitoring parameters are sufficient to calculate each SDG impacts especially the emission reductions/2/ in accordance with the methodology/38/. The parameters will be calculated or measured as mentioned above in section D.4.8.

Sampling Plan

Sampling plan is designed by PP for monitoring the parameter W_{site} which is confirmed in line with the requirement for this parameter monitoring in the applied methodology. The sampling plan is designed according to the Standard of "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)"/36/.

The sampling plan including the below designs,

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

b. For each 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 PD, 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 60-130 days and Mature phase with 130-180 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 each 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 PDD should describe the system of random sampling taking into account stratification of each livestock population into a minimum of three weight categories as described above". Via site inspection, it is confirmed that for 9 swine farms involved, all the swine farms including market swine and breeding swine. Due to 9 swine farms have two types of swine, and as per applied methodology, each 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 swines 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/38/. 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)"/37/ 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)"/36/. The implementation of sampling plan including monitoring, data recording and collection, QA/QC procedure, emergency proccedure 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 9 swine farms during each monitoring periods. The monitoring forms will be filled out daily by the Breeders in the 9 swine farms 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. **Other elements of monitoring plan** The validation team has analyzed the content to the monitoring plan against the requirements of the applied methodology and the applicable methodological tools and came to the following conclusions: 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 PDD 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 GS 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. **Principle of Monitoring:** Listed as above table for each monitored value and assessed by validation team. All the monitoring instruments and meters will be installed and calibrated in accordance with industry requirements and manufacturer specifications . **Parameters to be monitored:** Listed as above table and assessed by validation team. **Data collection and management:** The monitoring activities will be conducted by GS monitoring team. Then the survey result should be summarized by monitoring team member. If the data record is missing or damaged during the monitoring periods, PP will take effective mitigations to solve the problem which has been provided in the PDD and confirmed by VVB as reasonable.

	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. **Quality assurance and quality control procedures:** The PDD contains sufficient description on how quality will be controlled and assured in the monitoring of emission reductions. Training will be provided to relevant personnel. **Emergency Procedure** In case of malfunction and/or damage of any system or piece of the process, it may cause damage to the operation of the system, especially serious damage to the biogas generation and combustion system it must be dealt with as soon as possible and reported to the responsible technician immediately, and project proponents will take actions to make sure the emission calculations to be conservative.
Findings	CL 09, CL 10, CL 11, CL 12, CL 13 and CAR 12, CAR 13, CAR 14, CAR 15, CAR 16 were raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The validation team confirms: • The parameters which are part of monitoring plan is in line with the PDD • The monitoring arrangements described in the monitoring plan of the PDD /1/ are feasible within the project design. • The PD will be able to implement the monitoring plan.

D.4. Start date, crediting period type and duration

Means of validation	The start date of the project is 09/09/2020 which is the date on signing the Equipment (biogas generators) purchase contract/10/. The assessment team has reviewed the Equipment (biogas generators) purchase contract/10/ and found date is correct and this is the earliest date on which contracts have been signed for equipment or construction/operation services required for the Project confirmed in line with the start date definition in "Principles & Requirements (version 1.2)"/47/. The PD has considered a crediting period of 5 years renewable starting from 01/01/2021 or two years prior to the date of Project Design Certification, whichever is later. The lifetime of the project is defined as 15 years checked from the Technical Agreement/12/ of anaerobic fermentation equipment as provided by PD and the details are found correct and consistent.
Findings	CL 14 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The project start date as stated in PDD/1/ has been validated as per the definition of start date given in the GS4GG Principles and Requirements/47/. • A crediting period of 5 years renewable has been selected by the PD as per GS4GG Principles and Requirements/47/. • The expected lifetime of the project indicated in the PDD is correct.

D.5. Safeguarding principles and Gender Sensitive assessment

Means of validation

The validation team has also checked mitigation measure with respect to the eleven Safeguarding Principles. The validation opinion is detailed below,

No	Safeguarding principles	Assessment of relevance to the project	Mitigation measure	Validation Opinion
1	**Human Rights**			
	a. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the	No	Not required	After China's reform and opening up in 1992, China formally established modern social development, basic human rights protection system and social insurance system reform which is verified based on local expertise

		Universal Declaration of Human Rights. b. The Project shall not discriminate with regards to participation and inclusion.			of the validator, hence it is verified that no impact of the human existence to this kind of project. a. The project activity is designed to install new animal waste management systems to to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons which is confirmed as completely obey the nation and local laws as verified by FSR of the project/6/ and will not lead to violations or human rights abuses in any kind. As such there is no risk involved and therefore the project does not violate this safeguarding principle. b. Via on-site inspection and interview with chief and staffs of farms, CTI confirmed that the project has no discrimination to any participation and inclusion. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	2	**Gender Equality and Women's Rights**			
		a. The Project shall not directly or indirectly reinforce gender-based discrimination and shall not lead to/contribute to adverse impacts on gender equality and/or the situation of women. b. Projects shall apply the principles of nondiscrimination, equal treatment, and equal pay for equal work c. The Project shall refer to the country's	No	N/A	The project is designed to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. a. The validation team has observed that the project will not directly or indirectly reinforce gender-based discrimination and shall not lead to/contribute to adverse impacts on gender equality and/or

		national gender strategy or equivalent national commitment to aid in assessing gender risks. d. (where required) Summary of opinions and recommendations of an Expert Stakeholder(s)			the situation of women. Besides, the validation team has verified that the project gives women more access to or control resources, entitlements and benefits by providing easy access to equal job opportunities. b. Via checking the labor contracts/26/, it is verified that project did not set up any barriers to the employment of women and has generated income and jobs opportunities for women. Besides, via checking the labor contracts/26/, CTI confirmed that all employees have benefits based on pregnancy, maternity/paternity leave, or marital status according to the Labor Law of the People's Republic of China /70/. c. It is concluded that the project apply the principles of nondiscrimination, equal treatment, and equal pay for equal work which is in line with the Labor Law of the People's Republic of China /70/ and China's gender related policies. d. Via checking the Stakeholder Consultation Report /3/, it is verified that there is no opinions and recommendations of an Expert Stakeholder(s) due to the project will not directly or indirectly reinforce gender-based discrimination and shall not lead to/contribute to adverse impact. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	3	**Community Health, Safety and Working Conditions**			

		a. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community.	No	N/A	The project is designed to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. The biogas produced is captured and then sent to the biogas generator for power generation and used by the AWMSs and swine farms. At the same time, and the residual biogas will be flared if there is any surplus biogas. Besides, the regularly trains on biogas safety and leakage to project employees was conducted to enhance the consciousness of safety of biogas, it will ensure that biogas leakage and safety hazards will not occur and to ensure the biogas will not affect the health of the workers. The fermented sludge from the aerobic composting system is used to produce organic fertilizer, the organic fertilizers which partly will be supplied to the farmers living around free and partly others will be sold as fertilizerout to the market which has been confirmed by site inspection and checking the Feasibility Study Report of the project/6/. The validation team has observed that the project will not cause community exposure to increased health risks and shall not adversely affect the health of the workers and the community which is verified by local expertise from validation team.

					As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	4	**Cultural Heritage, Indigenous Peoples, Displacement and Resettlement**			
		4.1 Sites of Cultural and Historical Heritage			
		Does the Project Area include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture?	No	N/A	During on-site inspection, CTI confirmed that project area does not include sites, structures, or objects with historical, cultural, artistic, traditional or religious values or intangible forms of culture. The project does not utilise Cultural Heritage, including the knowledge, innovations, or practices of local communities, affected communities. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		4.2 Forced Eviction and Displacement			
		Does the Project require or cause the physical or economic relocation of peoples (temporary or permanent, full or partial)?	No	N/A	During on-site inspection, CTI confirmed that new animal waste management system will distribution of the fertilizer produced by this project to local people for free that can help to reduce the costs of purchasing fertilizer. All the investment for the new animal waste management system is provided by Jiangxi Zhengbang Breeding Co. Ltd. It obviously does not cause physical or economic relocation of peoples. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		4.3 Land Tenure and other rights			
		Does the Project require any change to land tenure arrangements and/or access rights?	No	N/A	During on-site inspection and checking the FSR of the project/6/, CTI confirmed that project is operated in the swine farm owned

		For Projects involving land use tenure, are there any uncertainties with regards to land tenure, access rights, usage rights or land ownership?			by the project owner and the project was approved by local government and it does not require any change to land tenure arrangements and/or other rights such as resource access rights, community-based property rights and customary rights. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		4.4 Indigenous people			
		Are indigenous peoples present in or within the area of influence of the Project and/or is the Project located on land/territory claimed by indigenous peoples?	No	N/A	During on-site inspection and interview with local stakeholders, CTI confirmed that people have the same and equal access to the clean and renewable energy, and no one will be affected directly or indirectly in a negative way by the project. Besides, there are no indigenous people present within the area of influence nor the project is located on territory claimed by indigenous people. This is verified by on-site inspection and interview. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	5	**Corruption**			
		a. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects.	No	N/A	During on-site inspection, CTI confirmed that the project is implemented on the ground by the social enterprise. The ethical codes of the project partners are against corruption. In addition, the companies comply with all related economic laws and regulations of China confirmed by checking the business license of PP/5/.

					Hence, the Project does not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	6	**Economic Impacts**			
		6.1 Labour Rights			
		a. The Project Developer shall ensure that there is no forced labour and that all employment is in compliance with national labour and occupational health and safety laws, with obligations under international law, and consistency with the principles and standards embodied in the International Labour Organization (ILO) fundamental conventions. b. Workers shall be able to establish and join labour organisations c. Working agreements with all individual workers shall be documented and implemented and include: a) Working hours (must not exceed 48 hours per week on a regular basis), AND b) Duties and tasks, AND c) Remuneration (must include provision for payment of overtime), AND d) Modalities on health insurance, AND e) Modalities on termination of the contract with provision for voluntary resignation by employee, AND	No	N/A	Via checking the labor contracts/26/, it is verified that the employees are hired according to Labor Law of the People's Republic of China/70/ and following the relevant ILO conventions/58/. Hence no any form of forced or compulsory labor. Via checking the labor contracts/26/, it is verified that contract specify working hours (8 hours per day, 5 days per week), tasks and payments. All employees have benefits based on social security, pregnancy, maternity/paternity leave, or marital status which has been verified consistent with the request in Labor Law of the People's Republic of China /70/. All employees would provide their age information document, e.g. ID, when signing the labour contract, and the project owner did not and will not employ any child labour. Besides, the employees also have the right to establish labour unions and to carry on labour union activities in accordance with the PRC Labour Union Law and other applicable laws and regulations. As such there is no risk involved and therefore

		f) Provision for annual leave of not less than 10 days per year, not including sick and casual leave. d. No child labour is allowed (Exceptions for children working on their families' property requires an Expert Stakeholder opinion) e. The Project Developer shall ensure the use of appropriate equipment, training of workers, documentation and reporting of accidents and incidents, and emergency preparedness and response measures			the project does not violate this safeguarding principle.
		6.2 Negative Economic Consequences			
		Does the project cause negative economic consequences during and after project implementation?	No	N/A	Via checking the equipment purchase contract/10/ and interview with the Project Developer, it is verified that the equipment procurement cost of the project was borned by the project owner, and the project has positive economic benefits due to the reduced cost of buying fertilizer for local farmer. The project will be economically feasible through the sale of emission reduction credits. In addition, the project will create fair job opportunities for local people, which is good for the local economy. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	7	**Climate and Energy**			
		7.1 Emissions			
		Will the Project increase greenhouse gas emissions over	No	N/A	Via checking the ER sheet/2/, CTI confirmed that the project is

		the Baseline Scenario?			designed to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons thus decrease GHG emissions comparing with the baseline scenario. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		7.2 Energy Supply			
		Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	No	N/A	Via site inspection and checking the equipmen purchase contract/10/, CTI confirmed that the project activity enables 9 swine farms to use new animal waste management systems instead of the open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the swine manure, finally generate the power to swine farms. It is assumed that all the electricity consumed of the project activities comes from the electricity generated by the biogas, no additional will be from grid. Only when the electricity consumption generated by the project is not sufficient or the generator set in a shutdown state, the electricity will be imported from CCPG. Thus the project will not affect the availability and reliability of energy supply to other users. As such there is no risk involved and therefore the project does not violate this safeguarding principle.

	8	**Water**			
		8.1 Impact on Natural Water Patterns/Flows			
		Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?	No	N/A	The project is not involved in abstraction from water resources required to support biodiversity and other ecosystem services. It only makes use of the manure for generate biogas, and will not negatively affect the natural or pre-existing pattern of watercourses, groundwater and/or the watershed(s). As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		8.2 Erosion and/or Water Body Instability			
		Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion? Is the Project's area of influence susceptible to excessive erosion and/or water body instability?	No	N/A	The new animal waste management systems used in the project area could not directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion, and could not directly or indirectly impact on surface and ground waters or soil erosion on slopes due to all animal manure will be put into the new animal waste management systems to treat and is prohibited to discharge into the Groundwater and surface water which has been confirmed by site inspection and checking the EIA approval/8/. Via checking the Chinese fertilizer implementation standard/30/, it is verified that the fertilizer produced in this project is legal in China. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	9	**Environment, ecology and land use**			
		9.1 Landscape Modification and Soil			

		Does the Project involve the use of land and soil for production of crops or other products?	No	N/A	The project does not involve the production, harvesting, and/or management of living natural resources by small-scale landholders and/or local communities. Via on-site inspection and checking the Licenses for production and operation of the breeding livestock and poultry/9/ of all the swine farms, it is verified that al the swine farms of the project have obtained necessary approval from the local government hence they does not involve any use of crop land, and will not cause degradation in existing landscape function and services. It will not affect the health condition of any soils. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.2 - Vulnerability to Natural Disaster			
		Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	N/A	Via on-site inspection, it is verified that new animal waste management system used in the project area does not involve any land use changes. It would not lead to the exacerbation of impacts caused by natural or man-made hazards, such as landslides or floods. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		Principle 9.3 Genetic Resources			
		Could the Project be negatively impacted by or involve genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial	No	N/A	Via on-site inspection, it is verified that the project does not involve any use of GMOs, so it will not have negatively impacted by the use of genetically modified organisms or GMOs.

		development, or take place in facilities or farms that include GMOs in their processes and production)?			As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.4 Release of pollutants			
		Could the Project potentially result in the release of pollutants to the environment?	No	N/A	The project is designed to install new animal waste management systems to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Via on-site inspection, it is verified that the project does not involve any release of pollutants as the biogas was captured for power generation, the fermented sludge was treated in aerobic composting system, the wastewater was treated aerobically and then supplied to the farmers living around free for agriculture irrigation. Via checking the ER sheet, CTI confirmed that the project decrease GHG emissions comparing with the baseline scenario. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.5 Hazardous and Non-hazardous Waste			
		Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	Potential	The project activity will replace the current open anaerobic lagoons with 9 new closed anaerobic digesters. The biogas generated during the treatment	Via on-site inspection, it is verified that the project does not involve any hazardous materials resulting from their production, transportation, handling, storage and use in the Project. However, the risk was identified that the project, methane explosion may be caused if biogas is not handled properly during the operation period.

				process will be captured for power generation or flared. If biogas is not handled properly during the operation period of the project, methane leakage/ explosion may be caused.	The relate mitigation measures have been provided and added to the Monitoring Plan. The monitoring parameter of Employee Training of biogas safety operation has been listed for monitoring which is confirmed as the proper mitigation measures. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.6 - Pesticides & Fertilisers			
		Will the Project involve the application of pesticides and/or fertilisers?	No	N/A	Via on-site inspection, it is verified that the project does not involve any use of pesticides and/or fertilizers. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.7 Harvesting of Forests			
		Will the Project involve the harvesting of forests?	No	N/A	Via on-site inspection, it is verified that the project does not involve any harvesting of forests. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.8 Food			
		Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	No	N/A	Via on-site inspection, it is verified that the project does not involve modification of the quantity or nutritional quality of food available. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.9 Animal husbandry			
		Will the Project involve animal husbandry?	No	N/A	Via on-site inspection, it is verified that the project is designed to introduces new animal waste management

					systems to treat the manure and wastewater from the 9 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. The technology of the project is defined as waste disposal and resource utilization, the manure derived from existing swine farms, which are not changed and impact to the existing swine farms, hence the project is not involved in animal husbandry. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
		9.10 High Conservation Value Areas and Critical Habitats			
		Does the Project physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified?	No	N/A	Via site inspection, CTI confirmed that the project is not located in an area within a high conservation value area or within critical natural habitats. The project activity does not physically affect or alter largely intact or High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites identified. Furthermore, the "Measures for the Management of Livestock and Poultry Breeding in Hubei Province"/32/ was checked by CTI and it is confirmed that the government prohibited construction area including the High Conservation Value (HCV) ecosystems, critical habitats, landscapes, key biodiversity areas or sites. Oppositely, the project reduces the GHG emissions and protect

				the environment by using clean energy. As such there is no risk involved and therefore the project does not violate this safeguarding principle.
	9.11 Endangered Species			
	Are there any endangered species identified as potentially being present within the Project boundary (including those that may route through the area)? Does the Project potentially impact other areas where endangered species may be present through transboundary affects?	No	N/A	Via site inspection, CTI confirmed that there are no endangered species identified as potentially being present within the Project boundary. In addition, the new animal waste management system used in the project will not pose a threat to any species. As such there is no risk involved and therefore the project does not violate this safeguarding principle.

Assessment that project complies with 'gender sensitive' requirements

The justifications provided for the project complies with 'gender sensitive' requirements are assessed as per four mandatory questions included under Step 1 to 3 in "Gold Standard Gender Equality Guidelines and Requirements" in below table,

Questions	Justification
Question 1: Explain how the project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy?	The project reflects the key gender issues and requirements of Gender Sensitive design and implementation. Firstly, the gender-sensitive approaches have been used in stakeholder consultation which has been verified in the Stakeholoder Consulation Report/3/, this makes sure the information of project has been shared equitably with women and men stakeholders. Furthermore, via checking the Training notice/27/ and the labor contracts/26/, it is verified that the project has employed and trained women in the implementation of the project. This is also verified by on-site observation and interview with the women staffs.
Question 2: Explain how the project aligns with existing country policies, strategies and best practices	The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis. Via checking the labor contracts/26/ , CTI confirmed that the project creates the job opportunities for local people and advocated the employment of women including all 18 full-time jobs with an equal number of males and females,

		Also, the average monthly salary was the same for men and women Via comparing the labor contracts/26/ with the Labor Law of the People's Republic of China/70/, it is verified that the project respects all the rights to the women. This is also verified by on-site observation and interview with the woman staffs.
	Question 3: Is an Expert required for the Gender Safeguarding Principles & Requirements?	The project does not involve and is not complicit in any form of discrimination based on gender, race, religion, sexual orientation or any other basis. Via checking the labor contracts/26/ and the Training notice/27/. Also via checking the salary slips/27/, CTI confirmed that equal value has been made to both male and female which has also been confirmed during on-site interview. Hence, no gender experts are required for the Gender Safeguarding Principles & Requirements.
	Question 4: Is an Expert required to assist with Gender issues at the Stakeholder Consultation?	Via checking the Local Stakeholder Consultation Records/19/, it is verified that the Key Project Information which includes gender guidelines have been introduced to the local stakeholders. All assessment questions related to safeguarding principles, including principle 2 "Gender Equality and Women's Rights", have been discussed during the stakeholder consultation meeting as verified in the Local Stakeholder Consultation Records/19/ and SCR/3/. Also refer to above of Safeguarding Principle Assessment for detail analysis. Hence, no gender experts are required to engage in the Stakeholder Consultation.
Findings	CAR 17 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.	
Conclusion	The Safeguarding principles assessment is carried out according to the relevance to the project activity. Project developers discuss any possibilities in Safeguarding Principles of the GS4GG. The validation team considers the Safeguarding principles assessment has been based on the accurate local situation and the corresponding information has been included in the PDD. It is analyzed in the PDD that it would create no risks of relevance to the project activity in all aspects of Safeguarding principles assessment. The validation team also considers that no mitigation measures are required for the project activity.	

D.6. Local stakeholder consultation assessment

Means of validation	According to the GS4GG Stakeholder Procedure Requirements and Guidelines, Stakeholder Consultation process shall comprise of a minimum two rounds of consultation. The first round of Stakeholder Consultation shall include a physical meeting.

	In order to comply with the Gold Standard rules and guidance, the project proponent conducted the Stakeholder Consultation process. **First round of Stakeholder Consultation** The first round of Stakeholder Consultation has been conducted from September to October 2021 consisted of invitation process and a physical stakeholder consultation meeting held on 18/10/2021 in the 4th floor of Zhengbang Group, Ziwen Road, Zengdian Town, Yunmeng County, Xiaogan City, Hubei Province which is verified in the Stakeholder Consultation Report/3/. Before the meeting, the PD had invited the stakeholders as many as possible. For stakeholders from categories C, D, E, F and G, email invitation letters were sent out on 08/09/2021 and project introduction are provided in the mail so that stakeholders who can't attend the meeting can also raise their comments. This is verified by checking the emails/19/. For stakeholders from categories A, B, two channels were used for invitation including emails and public notice on 08/09/2021. This is verified by checking the photos and emails/19/. The consultation meeting was attended by 20 local stakeholders and 20 effective evaluation forms were delivered and received for project which has been verified by checking the attendance list and signed evaluation forms/19/. During the meeting the project owner introduced the project design and answering the questions raised by the stakeholders and the corresponding social and environmental impacts were discussed. The 'Input & Grievance Mechanism' form, the 'Sustainable Development Assessment 'questionnaires and 'Stakeholder Consultation Meeting Evaluation Form' were distributed to each participant and all participants were asked to respond to all questions from the forms and the questionnaire. The validation team was able to verify above by conducting the physical meeting and the site visit, and interviewing with the local stakeholders, checking the filled forms and questionnaires, meeting attendance list/19/ against the GS4GG Stakeholder Consultation Report for this project/3/. Most of participates held positive attitude towards the project and believe that it will have an overall positive impact on the local area and local residents, respondents sent clear message that the project has far more positive effects than negative ones. During the meeting, there are 3 comments regarding the environmental impacts, first crediting period and carbon mechanisms were raised by the participants and experts. The PD provide the feedbacks to each question with participants and experts' agreement. Since all the questions are related to the project technology and project mechanism operation, etc., not negative comments to the project design and monitoring methods, environment, social and economic impacts, thus it is verified that there is no need to change the project design. **Second round of Stakeholder Consultation** According to the GS4GG Stakeholder Procedure Requirements and Guidelines, Stakeholder Consultation process shall comprise of a minimum two rounds of consultation. As the first round of Stakeholder Consultation included a physical meeting. Thus, the SFR process was conducted only by emails in the time period between 10/09/2021 and 09/11/2021 as confirmed by checking the SFR evidence/20/. Via checking the emails invitation and feesbacks/20/, it is verified that PD has invited stakeholders who had attended the first round LSC to comment on the SCR, PDD and the Key project information from 10/09/2021 and 09/11/2021 covering two months which is in line with the GS4GG requirement. Furthermore, via checking the expert stakeholders consultation records/21/, it is verified that Expert Stakeholders whom from Development & Reform Commission of Hubei Province, Ecological Environment Bureau of Hubei Province, Agriculture and Rural Affairs Bureau of Hubei Province, and Women's Federation of Hubei Province were invited by emails on 08/09/2021 to raise opinion and recommendations related to certain Safeguarding Principles and SDG Impacts which have been provided by the PD, and the opinion and recommendations have been provided by Expert

	Stakeholders which has been considered in the SCR related to affirming the practice of creating jobs for the local area and encouraging the recruitment of women and also affirmed the work in the project will be no negative impact in these aspects during the implementation of the project. Thus, it is verified there is no improvement suggestion on the design of the project at the current stage. Based on the above assessment, the validation team hereby confirms that the Project fulfills the relevant criteria of the GS4GG Stakeholder Consultation. Furthermore, by checking the mail and website contents, it is verified that there is no stakeholder feedback was received during the Stakeholder Feedback Round. Based on the above assessment, the validation team hereby confirms that the Project fulfills the relevant criteria of the GS4GG Stakeholder Consultation. For the continuous input / grievance mechanism, PD has listed different methods. As confirmed through the onsite visit and interview with the stakeholders, CTI verified that the inputs/grievances mechanism has been in place. As per onsite checking the Grievance Book put at each swine farm and internet/email address which has been provided to local stakeholders, CTI verified that they have access to provide issues or comments through given methods.
Findings	CAR 18 was raised and resolved. Refer to Appendix 4 in this report for detail assessment.
Conclusion	The Validation team confirmed that the PD has conducted two rounds of stakeholder's consultation process prior to the submission of the request for registration based on GS4GG rules and solicit comments for the project activity has been addressed in the PDD. Via checking the relevant evidence/3/, /20/, /21/, /19/, it is verified that no comments were received from the local stakeholders and expert stakeholders regarding to the impact to the sustainability development by the project. Therefore, overall, the PD did not need to alter the original design of the project activity.

SECTION E. Internal quality control

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The final validation report was undergone a technical review by a qualified independent reviewer before requesting design certification of the project activity. The technical review was performed by a technical reviewer qualified in accordance with CTI's qualification scheme for GS validation and verification that meets the criteria of GS guidelines for qualification.

SECTION F. Validation opinion

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Shenzhen CTI International Certification Co., Ltd (CTI) has conducted the validation of the GS4GG project activity “Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province ”. The validation was performed on the basis of rules and requirements defined by GS4GG Principles and Requirements.

The validation is based on the baseline and methodology ACM0010, “GHG emission reductions from manure management systems” Version 08.0, the Stakeholder Consultation Report, and the final version of PDD. The validation consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up on-site visit and interviews with project participants and local stakeholders; iii) resolution of outstanding issues and the issuance of the final validation report.

In the course of the validation 18 Corrective Action Requests (CARs), 14 Clarification Requests (CLs) were raised and successfully closed. No Forwarded Action Requests (FARs) was raised.

The review of the project design documentation and additional documents related to baseline and monitoring methodology and subsequent background investigation have provided the CTI with sufficient evidence to validate the fulfilment of the latest valid GS4GG requirements.

In detail the conclusions can be summarized as follows:

- the project meets all eligibility criteria set by GS4GG.
- the project does not violate any of safeguarding principles set by GS4GG.
- the baseline scenario is correctly defined as per the applied methodology and relate tools;
- the project additionality is sufficiently justified in the PDD;
- all data and information used for ex-ante calculation of emission reductions is of projected and/or hypothetical nature;
- the monitoring plan of SDG parameters in the validated PDD is transparent and adequate;
- the project does not result in diversion of ODA.
- the project meets the stakeholder consultation requirements.
- the project contribution to SDG is determined.

The conclusions of this report show, that the project, as it was described in the PDD, is in line with all criteria applicable for the validation against the GS4GG requirements without any qualifications or limitations.

Therefore, the project is recommended to GS Sustain CERT for the submission of the validation report.

Appendix 1. Abbreviations

Abbreviations	Full texts
AWMS	Animal waste management system
BAU	Business-as-usual
BE	Baseline Emission
CAR	Corrective Action Request
CCPG	Central China Power Grid
CDM	Clean Development Mechanism
CL	Clarification Request
CO_2	Carbon dioxide
CP	Crediting Period
CTI	Shenzhen CTI International Certification Co., Ltd
DNA	Designated National Authority
EB	Executive Board
EIA	Environmental Impact Assessment
FAR	Forward Action Request
GHG	Green House Gas
GSC/GSP	Global Stakeholder Consultation Process
GS4GG	Gold Standard for the Global Goals
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
MoV	Means of Validation
MP	Monitoring Plan
ODA	Official Development Assistance
PD	Project Developer
PDD	Project Design Document
PE	Project Emission
PP	Project developer
PS	Project Standard
QC/QA	Quality control/Quality assurance
RFR	Request for Registration
SCR	Stakeholder Consultation Report
SD	Sustainable Development
SDG	Sustainable Development Goals
SFR	Stakeholder Feedback Round
tCO_2e	Tonnes of Carbon di oxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
V	Version
VER	Voluntary Emission Reduction
VVB	Validation and Verification Body
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Mr. Wenjun DU

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 13: Waste handling and disposal	TA 13.1: Solid waste and wastewater
	TA 13.2: Manure

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

Mr. Li Ziqi

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

Qualification						
Status	GHG Auditor	Validator	Validator	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 4: Manufacturing industries	TA 4.1. Cement and lime production
SS 5: Chemical industry	TA 5.1: Chemical industry
	TA 5.2: Caprolactam, nitric and adipic acid
SS 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	TA 11.1: Emissions of fluorinated gases
	TA 11.2: Refrigerant gas production
SS 12: Solvents use	TA 12.1: Chemical industry
SS 13: Waste handling and disposal	TA 13.1: Solid waste and wastewater
	TA 13.2: Manure

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

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	PD	GS4GG Project Design document of "Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province "	- Version No. 02, dated 27/10/2021 - Version No. 04, dated 09/10/2022 - Version No. 05, dated 02/02/2023 - Version No. 06, dated 06/03/2023	PD
2.	PD	Emission Reduction Calculation spreadsheet of "Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province "	- Version No. 02, dated 27/10/2021 - Version No. 03, dated 09/10/2022	PD
3.	PD	Stakeholder Consultation Report of "Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province "	- Version No. 01, dated 19/10/2021 - Version No. 02, dated 09/10/2022	PD
4.	PD	NPV and IRR calculation sheet	- Version No. 01, dated 27/10/2021 - Version No. 02, dated 09/10/2022	PD
5.	Local Market Supervision and Administration Bureau	Business License of PP	Business License of Jiangxi Zhengbang Breeding Co. Ltd and Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.	PP
6.	Jiangxi Huisen Environmental Technology Engineering Co., Ltd.	Feasibility Study Report	Issued on 16/03/2020	PP
7.	Dazhou Institute of Environmental Science	Environment Impact Assessment (EIA)	Issued in March 2020	PP
8.	Department of Ecology and Environment of Hubei Province	EIA approval	Issued on 26/05/2020	PP
9.	Local Bureau of Agriculture and Rural Affairs and Animal Husbandry and Veterinary Service	Licenses for production and operation	Licenses for production and operation of the breeding livestock and poultry of 9 swine farms	PP
10.	PP and manufacturers	Equipment purchase contracts	Equipment purchase contracts of all the involved main equipment, a. biogas generator, signed on 09/09/2020 b. flare system, signed on 10/09/2020	PP

			c. anaerobic tanks signed on 10/09/2020 d. turnover machines signed on 11/09/2020	
11.	PP and Nanchang Tiangao Environmental Protection Technology Co., Ltd.	General contract of engineering construction	General contract of engineering construction of the project signed on 13/09/2020	PP
12.	Manufacturers	Technical agreement	Technical agreement of main equipment	PP
13.	PP	Operation log of the project	Operation log of the project	PP
14.	PP	Technical flow chart	Technical flow chart in the project site	PP
15.	PP	Record of operation started date of each swine farm	Record of operation started date of each swine farm	PP
16.	PP	Record of construction and operation started date of each AWMS plant	Record of construction and operation started date of each AWMS plant	PP
17.	PP	Sale records of marketing swine	Sale records of marketing swine of year 2021	PP
18.	PP	Photo of baseline lagoon	Photo of baseline lagoons of 9 swine farms	PP
19.	PP	Local Stakeholder Consultation Records	Local stakeholder consultation process evidences: - The email for invitation; - Photo of all the invitation channel - LSC Meeting attendance's list with signature; - All filled evaluation forms by attendance in the Meeting	PP
20.	PP	Stakeholder Feedback Round	Stakeholder Feedback Round process evidences: - The email for invitation of the on-line consultation; - The feedback emails	PP
21.	PD and Expert stakeholders	Expert stakeholders consultation records	Expert stakeholders consultation records including email interview records	PP
22.	PP	Declaration of no double counting and not involved in other GHG scheme	Declaration of no double counting issued on 12/03/2021 Declaration of not involved in other GHG scheme issued on 12/02/2021	PP
23.	PP and Hubei Feilong Agricultural Ecological Technology Co., Ltd.	Sale agreement of organic fertilizer	Issued on 05/12/2020	PP
24.	PP	ODA declaration	Declaration of Non-Use of ODA by project owner of GS11333 issued on 26/08/2021	PP
25.	PP	Record keeping book	Record keeping book including employment and salary	PP
26.	PP and employees	Labor contracts	Labor contracts signed with employees for implementation of this project	PP
27.	PP	Training notice	Annual Training notice of project	PP

28.	PP	Meeting attendance record	Meeting attendance record	PP
29.	Ministry of Agriculture and Rural Affairs of China	National Action Plan	National Action Plan for Resource Utilization of Livestock Manure (2017-2020) http://www.moa.gov.cn/nybgb/2017/dbq/201801/t20180103_6134011.htm	Public Website
30.	National Ministry of Agriculture and Rural Affairs	Chinese fertilizer implementation standard	https://www.163.com/dy/article/GDJC0BVN0537393M.html	Public Website
31.	General Office of the People's Government	Resource Utilization Plan	Notice on Strengthening the Resource Utilization Plan and Ledger Management of Livestock and Poultry Manure http://www.gov.cn/zhengce/zhengceku/2021-12/27/content_5664765.htm	Public Website
32.	General Office of the People's Government of Hubei Province	Measures for the Management of Livestock and Poultry Breeding in Hubei Province	http://sft.hubei.gov.cn/bsfw/bmcxfw/gfxwjcxxt/202102/t20210203_3333799.shtml	Public Website
33.	Ministry of Ecology and Environment of the People's Republic of China	Baseline emission factor of China	2019 China regional power grid carbon dioxide baseline emission factor OM calculation instructions http://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202012/t20201229_815386.shtml	Public Website
34.	IPCC	IPCC	2006 IPCC Guidelines for National Greenhouse Gas Inventories	Public Website
35.	IPCC	IPCC Fifth Assessment Report	IPCC Fifth Assessment Report	Public Website
36.	UNFCCC	Standard of Sampling and surveys	Standard of "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)"	UNFCCC website
37.	UNFCCC	Guideline of Sampling and surveys	Guideline of the "Sampling and surveys for CDM project activities and programmes of activities (Version 04.0)"	UNFCCC website
38.	UNFCCC	CDM Approved Methodology ACM0010	"GHG emission reductions from manure management systems" (Version 08.0)	UNFCCC website
39.	UNFCCC	Methodological tool	Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)	UNFCCC website
40.	UNFCCC	Methodological tool	Baseline, project and/or leakage emissions from electricity consumption and monitoring of power generation (Version 3.0)	UNFCCC website
41.	UNFCCC	Methodological tool	Project emissions from flaring (Version 04.0)	UNFCCC website
42.	UNFCCC	Methodological tool	Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 07.0)	UNFCCC website
43.	UNFCCC	Methodological tool	Project and leakage emissions from anaerobic digesters (Version 02.0)	UNFCCC website
44.	UNFCCC	Methodological tool	Common practice (Version 03.1)	UNFCCC website

45.	UNFCCC	Methodological tool	Investment analysis (version 11.0)	UNFCCC website
46.	GS	GS4GG PDD template	Gold Standard for the Global Goals Key Project Information & Project Design Document (PDD) Template, version 1.2, 14/10/2020	GS Website
47.	GS	Gold Standard for the Global Goals Principles and Requirements	Version 1.2	GS Website
48.	GS	Gold Standard for the Global Goals Safeguarding Principles & Requirements	Version 1.2	GS Website
49.	GS	Gold Standard for the Global Goals Community Services Activity Requirements	Version 1.2	GS Website
50.	GS	Gold Standard for the Global Goals Stakeholder Consultation and Engagement Requirements	Version 1.2	GS Website
51.	GS	GS4GG GHG Emissions Reduction & Sequestration Product Requirements	Version 2.1	GS Website
52.	Public Info	Days for pigs to be slaughtered	Number of days for pigs to be slaughtered by existing large-scale breeding groups in China https://zhuanlan.zhihu.com/p/38676811 http://finance.people.com.cn/n1/2017/1121/c1004-29658996.html	Website
53.	National Standard	GJJ/T54-93	Design code for wastewater stabilization ponds	Public Website
54.	National Development and Reform Commission and Ministry of Construction	Economic Evaluation Method and Parameter of Construction Projects	Version 03	Public Website
55.	National Development and Reform Commission	Financial benchmark rate	“Financial benchmark rate of return of construction projects” https://www.ndrc.gov.cn/fggz/gdzctz/tzfg/201907/W020191104862129391071.pdf	Public Website
56.	Ministry of Ecology and Environment of China	China cap & trade scheme	http://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202101/t20210105_816131.html	Public Website
57.	Ministry of Ecology and Environment of China	Enforced company list	http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf	Public Website
58.	ILO	ILO conventions	https://www.ilo.org/global/lang--en/index.htm	Public Website
59.	State Institution	National Enterprise Credit Information Publicity System	http://www.gsxt.gov.cn/	Public Website
60.	PP	Public information of the project owner	https://www.sbtjt.com/	Public Website

61.	National Government	Public information of local temperature	https://baike.baidu.com/item/%E6%B9%96%E5%8C%97/173862?fr=aladdin	Public Website
62.	Public Website	Price index of investment in fixed asset	http://www.stats.gov.cn/	Public Website
63.	Public Website	Development and Reform Commission of Hubei Province	https://fgw.hubei.gov.cn/	Public Website
64.	Public Website	Other public information from Department of Agriculture and rural affairs of Hubei Province	http://nyt.hubei.gov.cn/	Public Website
65.	VVB	Site Visit Photo	Photo taken by validator during site visit including main equipment, swine farms, monitoring devices, etc.	N/A
66.	Ministry of Agriculture and Rural Affairs of China	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	Public Website
67.	National Standard	GB/T 36195 -2018	Technical specification for sanitation treatment of livestock and poultry manure https://oss.baigongbao.com/2020/12/14/MRyhTKQcWC.pdf	Public Website
68.				
69.	China State Council	Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming	http://www.gov.cn/flfg/2013-11/26/content_2535095.htm	Public Website
70.	National Government	Labor Law of the People's Republic of China	-	Public Website
71.	National Data from National Bureau of Statistics of China	Average Wage of Staff and Workers and Related Indices	http://data.stats.gov.cn/easyquery.htm?cn=C01	Public website
72.	State Council of the PRC	Value Added Tax	Provisional Regulations of the People's Republic of China on Value Added Tax issued on 01/01/2019	Public website
73.	State Taxation Administration	Income Tax Law	Enterprise Income Tax Law of the People's Republic of China	Public website
74.	Standing Committee of the 13th National People's Congress	Law of City Maintenance	Law of the People's Republic of China on City Maintenance and Construction Tax (Draft)	Public website
75.	Hubei Provincial Government	Educational Surcharge	Notice of Hubei Provincial People's Government on the Imposition of Local Education Surcharges	Public website
76.	State Council of the PRC	Detailed Rules of VAT	Detailed Rules for the Implementation of the Provisional Regulations on Corporate Income Tax of the People's Republic of China'	Public website

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CAR/FAR from preliminary review

CAR ID	01	**Section No.**	-	**Date : 26/08/2022**
Description of CAR				
PD shall supply supporting data for all parameters in time for validation/design review, or allocation may be delayed. This includes and is not limited to: ER spreadsheets, individual study calculations, survey results, study reports etc.				
Project developer response				**Date :** 09/09/2022
The supporting data for all parameters have been supplied for validation/design review, this document includes but not limited to ER spreadsheets, survey table, record table, samples calculation sheet etc.				
Documentation provided by project developer				
/1/ version 04 /2/ /3/ /4/ /8/				
VVB assessment				**Date: 19/09/2022**
All the supporting evidence have been provided to VVB for validation and assessed in the whole report. Refer to Appendix 3 for the details of all the supporting evidence. CAR 01 is closed.				

CAR ID	02	**Section no.**	-	**Date: 26/08/2022**
Description of CL				
In the Validation site visit VVB shall check whether the manure is discharged into natural water resources (e.g., rivers or estuaries) or not.				
Project developer response				**Date:** 09/09/2022
The project activity will replace the current open anaerobic lagoons with 9 new closed anaerobic digesters. The biogas generated during the treatment process will be captured for power generation, and surplus biogas is destroyed through the flaring system (if any). After anaerobic digestion, the fermentation liquid after anaerobic fermentation is separated from solid and liquid, and the biogas residue is used to produce solid organic fertilizer, which will be sold at a price lower than the market price. In fertilizer season, the biogas liquid is used as organic fertilizer in orchards, feed lands and pollution-free vegetable bases, and the liquid organic fertilizer will be distributed to nearby farmers free of charge. In the non fertilizer season, the biogas slurry will enter the sewage treatment system and the oxidation pond for purification treatment before being discharged after reaching the livestock wastewater discharge standard. Comprehensive utilization and resourceful treatment of the manure waste are encouraged by the local government. And all the manure from the swine farms will be put into the AWMSs as it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming. Therefore, the project does not involve any activity that causes alteration of any resource, or contested legal rights and other disputes, therefore the need for acquiring any specific legal right is not applicable.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
Via site inspection, VVB is able to verify that manure is not discharged into natural water resources (e.g. rivers or estuaries), which is also confirmed by site interview with the local officer from Environment and Ecology Bureau. In addition, CTI confirmed that the swine manure is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming/69/. CAR 02 is closed.				

CAR ID	03	**Section No.**	-	**Date : 26/08/2022**
Description of CAR				

VVB shall the check and provide its opinion in validation report for justification given by PD for; the applicability criteria as per ACM0010 and project eligibility as per GS4GG Principles & Requirements; Community Services Activity Requirements and GHG Emissions Reduction & Sequestration Product Requirements
Project developer response **Date :** 09/09/2022
The Applicability criteria analysis to ACM0010, GS4GG Principles & Requirements; Community Services Activity Requirements and GHG Emissions Reduction & Sequestration Product Requirements have been described in section A.1.1 and B.2, please refer to PDD.
Documentation provided by project developer
/1/ version 04
VVB assessment **Date: 19/09/2022**
CTI has provided the assessment of the applicability criteria as per ACM0010 and project eligibility as per GS4GG Principles & Requirements; Community Services Activity Requirements and GHG Emissions Reduction & Sequestration Product Requirements in this validation report. Refer to section D.2 for detail assessment of project eligibility as per GS4GG Principles & Requirements; Community Services Activity Requirements and GHG Emissions Reduction & Sequestration Product Requirements. Refer to section D.3.2 for detail assessment of applicability criteria of ACM0010. CAR 03 is closed.

FAR ID	01	**Section No.**	-	**Date : 26/08/2022**
Description of CAR				
The Project developer shall confirm and VVB shall validate that, the project activity is: (i) Not a grid connected, the power generated will be used for captive consumption only; (ii) Not a applying, transition or de-registered from CDM or any voluntary carbon crediting scheme; (iii) Declaration of No Double Counting Statement, (iv) Confirmation of the GS VER legal ownership to be discussed during proposed/postponed local stakeholder consultation, (v) The legal ownership lies with PD and confirmation by all 9 subsidiaries				
Project developer response				**Date :** 09/09/2022
(i) The power generated are all used by the operation of AWMSs and the 9 swine farms and is not connected to another user or to the regional power grid and the baseline emissions associated with electricity generation will not be claimed. (ii) Swine Farm Animal Manure Management System GHG Mitigation Project in Hubei Province installs new animal waste management systems to a group of 9 swine farms in Hubei Province, which are owned by Jiangxi Zhengbang Breeding Co. Ltd (hereinafter called" Zhengbang"). The project activity has been designed as single project implemented at 9 animal farms. The purpose of the project activity is to treat the manure and wastewater from the 9 existing swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. Therefore, the project is a new project, not a applying, transition or de-registered from CDM or any voluntary carbon crediting scheme; (iii) The project owner has signed the Declaration of No Double Counting Statement and Declaration of not involved in other GHG scheme to ensure that the project will not apply for emission reduction credits or labels under any other schemes other than GS. Please refer to the document named *Declaration of No Double Counting-Zhengbang Hubei* for more information. (iv) All the Animal Manure Management Systems (AMMSs) were invested by the project owner, who has full and uncontested legal ownership of the credits that will be generated under Gold Standard Certification. In addition, confirmation of the GS VER ownership was also be discussed during the local stakeholder consultation held on 18/10/2021. The project owner has the legal ownership of the emission reductions generated by the project activity. Refer to section A.1.2 of the PDD and Section C.2 for further details. (v) All the Animal Manure Management Systems (AMMSs) of the 9 swine farms were invested by the project owner, who has full and uncontested legal ownership of the credits that will be generated under Gold Standard Certification. In addition, confirmation of the GS VER ownership will also be discussed during the local stakeholder consultation, which was held on 18/10/2021. The project owner has the legal ownership of the emission reductions generated by the project activity. Investment decision of the entire project were made by Jiangxi Zhengbang Breeding Co. Ltd. (Project Owner). All the 9 swine farms were owned by the project owner, who will make detailed plan for the whole project.				
Documentation provided by project developer				
/1/ version 04 /22/ /3/				

VVB assessment	Date: 19/09/2022
Via site inspection and the assessment in the whole report, CTI confirmed that (i) The electricity generated from the project in the anaerobic process was captured for power generation and surplus biogas is destroyed through the flaring system (if any). The electricity generated are all used by the operation of AWMSs and the 9 swine farms and is not connected local power grid company. (ii) Via checking the Declaration of no double counting and not involved in other GHG scheme/22/, CTI confirmed that the emission reductions will not be double counted. In conclusion, CTI verified that Project Developer has provided Gold Standard with satisfactory justification that no double counting of emission reductions occur. Refer to section D.2 for detail assessment of not involved in any voluntary carbon crediting scheme. (iii) Declaration of no double counting and not involved in other GHG scheme/22/ has been provided by PD and checked by CTI. (iv) Via checking the SCR report/3/, it is confirmed that confirmation of the GS VER ownership had been discussed during the local stakeholder consultation. (v) Via site inspection and interview with staffs of the 9 subsidiaries, it is confirmed that 9 subsidiaries were also investment by project owner, so the project owner has the legal ownership of the emission reductions generated by the project activity. FAR 01 is closed.	

FAR ID	02	Section No.	-	Date : 26/08/2022
Description of CAR				
PD shall conduct Stakeholder Consultation and provide final Local Stakeholder Consultation Report. PD shall address in detail the LSC during validation stage and corresponding assessment by GS VVB in its validation report.				
Project developer response				**Date :** 09/09/2022
The final Local Stakeholder Consultation Report has been completed. Please refer to the document named *SCR-Zhengbang Hubei-GS 11333-V02-CTI-revised* for more details.				
Documentation provided by project developer				
/1/ version 04 /3/				
VVB assessment				**Date: 19/09/2022**
The local stakeholder meeting has been held on 18/10/2021 and all the related information has been updated in the PDD and the SCR/3/ has been provided to CTI during the validation process. The validation assessment has been provided in the section D.6 of this report. FAR 02 is closed.				

FAR ID	03	Section No.	-	Date : 26/08/2022
Description of CAR				
A Continuous Input and Grievance Mechanism must be set up prior to starting validation and a note added to the PDD that full GS consultation will be carried out as soon as the situation allows.				
Project developer response				**Date :** 09/09/2022
A detailed Continuous Input and Grievance Mechanism has been set up, please refer to section E.2 of PDD for more details. And then the stakeholder consultation physical meeting has been carried out, 1st round of Local stakeholder consultation physical meeting held on 18/10/2021 in the 4th floor of Zhengbang Group, Ziwen Road, Zengdian Town, Yunmeng County, Xiaogan City, Hubei Province; The 2nd round of Stakeholder Consultation, the Stakeholder feedback round is held for two months between 10/09/2021 and 09/11/2021. All stakeholders that participated in the Stakeholder Consultation physical meeting were invited to the Stakeholder Feedback Round, including those who were invited but unable to attend. The electronic version and paper copy Project Information Note and Draft PDD are sent to the stakeholders for review and feedback. People can give feedback by replying the invitation email, etc., and all the feedback were recorded. Please refer to the document named *SCR-Zhengbang Hubei-GS 11333-V03-CTI-revised* for more details.				
Documentation provided by project developer				
/1/ version 04 /3/				
VVB assessment				**Date: 19/09/2022**

For the continuous input / grievance mechanism, PD has listed different methods. As confirmed through the onsite visit and interview with the stakeholders, CTI verified that the inputs/grievances mechanism has been in place. As per onsite checking the Grievance Book put at each swine farm and internet/email address which has been provided to local stakeholders, CTI verified that they have access to provide issues or comments through given methods. FAR 03 is closed.

Table 2. CL from this validation

CL ID	01	**Section no.**	A.1	**Date : 26/08/2022**
Description of CL				
1. PD is requested to clarify the status of the swine farms, if existed in baseline or not. 2. The technical description of project is not clear, which have been newly constructed or installed are not clarified, and treatment process is missing. 3. The expected biogas production is not clarified. 4. The power generation part is not clarified. 5. If the ER related to power generation claimed or not is not clarified. 6. Total ER value for 1st crediting period is not clarified.				
Project developer response				**Date :** 09/09/2022
1. The swine farms involved in this project is existing, which has described in Section A. 2. The technical description about the project is updated in Section A. 3. It is estimated that total 31,354,493m^3 biogas are expected to be generated annually. This information is included in Section A. 4. the biogas generated during the treatment process is captured for electricity generation. The electricity generated are all used by the operation of AWMSs and the swine farms. This information is included in Section A. 5. The power generated are all used by the swine farms and will not be connected to another user or to the regional power grid and the baseline emissions associated with electricity generation will not be claimed. This information is included in Section A. 6. 282,734 tCO_2e emission reductions will be produced annually and total emission reductions are 1,413,670 tCO_2e in the first crediting period. This information is included in Section A.				
Documentation provided by project developer				
/1/ version 04 /2/ /6/				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the status of the swine farms has been clarified as existing which is confirmed as actual via site inspection and checking the FSR/6/. 2. The revised PDD is checked, CTI confirmed that the technical description of project is clear, which have been newly constructed or installed has been clarified, and treatment process is added which is confirmed as actual via site inspection and checking the FSR/6/. 3. The revised PDD is checked, CTI confirmed that the expected biogas production has been clarified which is confirmed as correct by checking the FSR/6/. 4. The revised PDD is checked, CTI confirmed that the power generation part has been clarified which is confirmed as actual via site inspection and checking the FSR/6/. 5. The revised PDD is checked, CTI confirmed that the ER related to power generation is not claimed by PP and has been clarified clearly in the PDD. 6. The revised PDD is checked, CTI confirmed that the value of total ER value for 1st crediting period is clarified which is verified as correct by checking the ER sheet/2/. CL 01 is closed.				

CL ID	02	**Section no.**	A.1.1	**Date: 26/08/2022**
Description of CL				
1. The version of GS4GG GHG Emissions Reduction & Sequestration Product Requirements is not the latest valid version. 2. The project boundary is not complete in eligibility (c). 3. The information of project owner is not clarified in eligibility (e).				
Project developer response				**Date:** 09/09/2022

1. The version of GS4GG GHG Emissions Reduction & Sequestration Product Requirements has been updated to 2.1.
2. The project boundary has been corrected as: the project boundary is defined based on ACM0010 GHG emission reductions from manure management systems (Version 08.0). The spatial extent of the project boundary encompasses the site of the Animal Waste Management Systems (AWMSs), the power generation equipment, the flaring system and the power/heat source. Refer to section B.3 of the PDD for more details.
3.The project owner information has been added to section A.1.1, the details as follows: As the project owner, Jiangxi Zhengbang Breeding Co. Ltd is in the state of ongoing operation and has no administrative discrimination information, not listed as business abnormal catalo information and serious illegal untrustworthy enterprise list (blacklist) information by querying the national enterprise credit information publicity system.

Documentation provided by project developer

/1/ version 04
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/59/

VVB assessment **Date: 19/09/2022**

1. The revised PDD is checked, CTI verified that the version has been updated to 2.1 which is confirmed as the latest available version.
2. The revised PDD is checked, CTI verified that the information of project boundary is correct and complete and consistent with the section B.3 of the PDD which has been correct defined as per the applied methodology.
3. The revised PDD is checked, CTI verified that information of project owner has been added in the section A1.1 of PDD. Through checking the company information in National Enterprise Credit Information Publicity System/59/, CTI confirmed that PPs are in good standing and legally operated and allowed to operate within the required jurisdiction, the financial health is verified. And by checking the website, CTI confirmed that PPs never have been suspected of insolvency or legal/criminal notices placed against it or any of its Directors.

CL 02 is closed.

CL ID	03	**Section no.**	A.1.1	**Date: 26/08/2022**

Description of CL

For justification of eligibility (g), PD is requested to clarify if any manure from the swine farms will be discharged into any natural water resources.

Project developer response **Date:** 09/09/2022

For this project, all the manure from the swine farms will be put into the AWMSs as it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming. Which has been added to eligibility (g).

Documentation provided by project developer

/1/ version 04

VVB assessment **Date: 19/09/2022**

The revised PDD is checked, CTI confirmed that the swine manure is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming/69/. Furthermore, via site inspection, VVB is able to verify that manure is not discharged into natural water resources (e.g. rivers or estuaries), which is also confirmed by site interview with the local officer from Environment and Ecology Bureau.
CL 03 is closed.

CL ID	04	**Section no.**	B.2	**Date: 26/08/2022**

Description of CL

In section B.2 of PDD,

1. If the project introducing a new animal waste management system or a combination of animal waste management systems is not clarified as per the request of the methodology
2. It the project is greenfield is not clarified.
3. How the 9 swine farms are managed under confined conditions is not clarified.
4. The regulation for manure is not discharged into natural water resources is not clarified.
5. The listed depth of the baseline open lagoons is not the correct value.
6. The evidence of annual average ambient temperature at the site is not clarified.
7. The minimum retention time of manure waste in the open anaerobic lagoons is not correct via site visit confirmation.

8.	PP is requested to clarify how the AWMS(s) in the project case results in no leakage of manure waste into ground water based on the actual material used.

Project developer response	**Date:** 09/09/2022

1. For this project, 9 sets of new AWMS are installed in 9 existing swine farms in order to treat the manure and wastewater from these swine farms, which avoids methane emissions generated in the baseline uncovered anaerobic lagoons and the biogas generated during the treatment process will be captured for electricity generation, which result in less GHG emissions.
2. This project is a greenfield project.
3. This project introduces new AWMSs to a group of 9swine farms in Hubei Province, which are owned by Jiangxi Zhengbang Breeding Co. Ltd Shuangbaotai is one of the leading national leading agricultural enterprises in the host country. Also, all the swine farms of the project have obtained the licenses for production and operation of the breeding livestock and poultry issued by local government, So, the farms in the project boundary contain swine populations. Also, all the swine is managed under confined conditions, which can be confirmed during site visit.
4. The swine manure is dumped into open anaerobic lagoons, and it is prohibited to discharge into any natural water resources without treatment according to Regulations on Prevention and Control of Pollution from Livestock and Poultry farming.
5. The open anaerobic lagoons considered in the baseline scenario are designed for deep storage and has a depth of 3-5 meters in accordance with the" design code for wastewater stabilization ponds (GJJ/T54-93).
6. The annual average ambient temperature at the site is 16°C, which is higher than 5°C.
7. The minimum retention time of manure waste in the open anaerobic lagoons is not less than 45 days, i.e., at least 60 days in the baseline scenario.
8. The anaerobic tanks of the AWMS in the project case is fully enclosed and have steel layer, which can ensure that no leakage of manure waste into ground water takes place.

Documentation provided by project developer

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/60/
/61/
/69/

VVB assessment	**Date: 19/09/2022**

1.	The revised PDD is checked, CTI confirmed that the clarification has been added, via site inspection and checking the FSR/6/, it is verified that project introducing 9 new AWMSs not combination of AWMS.
2.	The revised PDD is checked, CTI confirmed that the clarification has been added, via site inspection and checking the FSR/6/, it is verified thatall manure waste produced from the existing 9 swine farms was left to decay in 10 uncovered anaerobic lagoons at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility prior to the implementation of the project. Hence it belongs to the existing facilities which confirmed in line with the definition of applied methodology.
3.	The revised PDD is checked, via site inspection and checking the Licenses for production and operation of the breeding livestock and poultry/9/ for each swine farm, and furthermore via checking the public information of the project owner/60/ and based on the local expertise of validation team, CTI confirmed that the project owner is is one of the leading national leading agricultural enterprise with the large-scale of swine farms in China, CTI confirmed that all the livestock population in the 9 swine farms within the project boundary is managed under confined conditions.
4.	The revised PDD is checked, CTI confirmed that the regulation has been added clearly. All the swine manure is dumped into open anaerobic lagoons and are not discharged into natural water resources. This is verified by checking the Licenses for production and operation of the breeding livestock and poultry/9/ and checking the Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming/69/.
5.	The revised PDD is checked, CTI confirmed that the value has been revised accordingly. In the baseline scenario the depth of the open lagoons used for manure management under the baseline scenario is from 3-5 meters higher than 1m. This is verified by checking the photo of baseline lagoon/18/ and verified by checking the national standard "Design code for wastewater stabilization ponds (GJJ/T54-93)"/53/.

6. The revised PDD is checked, CTI confirmed that the evidence has been provided. This is verified by checking the public information of local temperature/61/.
7. The revised PDD is checked, CTI confirmed that the days have been revised to the actual value accordingly. 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. This is verified by by interview with chiefs and staffs of the farms.
8. The revised PDD is checked, CTI confirmed that the clarification has been added. The manure from project will be utilized to produce fertilizer after methane capture, hence there is no leakage of manure waste into ground water occurred which is confirmed by site inspection and checking the produced fertilizer. Furthermore, via site inspection of the anaerobic tanks, CTI confirmed that the material for the tanks is carbon steel and the tanks are totally enclosed without any leak can be found. Via checking the Technical agreement of anaerobic tank/12/, it is verified that the digester equipped with steel layer on the bottom will not cause leakage of manure waste into ground water.

CL 04 is closed.

CL ID	05	**Section no.**	B.5.1	**Date: 26/08/2022**

Description of CL

For prior consideration, how the project satisfy the clause 4.1.49 Prior Consideration for retroactive projects of the GS4GG Principles & Requirements version 1.2 is not clarified.

Project developer response **Date:** 09/09/2022

As per “principles & requirements (version 1.2)”, the Retroactive project is defined as” the Stakeholder Consultation (1st round) is conducted after the Project Start Date”. For this project, the Stakeholder Consultation (1st round) is conducted on 18/10/2021 and the project start date is 09/09/2020, so this project is a Retroactive project. According to clause 4.1.49 of GS4GG Principles & Requirements (Version 1.2), Retroactive projects shall submit the required documents for preliminary review (time of first submission) within one year of the project start date. Retroactive Project submitted at a date later than one year from the project start date will not be eligible for Gold Standard certification.

For this project, the project start date is 09/09/2020, and PP have submitted the required documents for preliminary review on 06/09/2021 which within one year of the project start date. Therefore, the project is eligible for Gold Standard certification.

Documentation provided by project developer

/1/ version 04

/6/

VVB assessment **Date: 19/09/2022**

The revised PDD is checked, CTI confirmed that clarification has been added. As per GS4GG Principle & Requirements version 1.2/47/, the regular cycle projects are exempt from prior consideration of revenue carbon checks. The proposed project activity is a retroactive project. Hence, the assessment is as below,

The Feasibility Study Report which confirmed as including prior consideration of carbon revenue was completed on 16/03/2020/6/, besides, the online meeting was conducted on 08/07/2020, when the project proponents determined to apply for Gold Standard certification of this project and the start date of the project was 09/09/2020 (see below assessment).

The local stakeholder meeting was postponed due to COVID-19 was prevailing in China. The project has been submitted for review to GS registry on 06/09/2021 which is within one year from the date of project start date of 09/09/2020, thus it is verified that the project satisfies the prior consideration requirement as defined in the GS4GG Principles & Requirements version 1.2, clause 4.1.49 Prior Consideration for retroactive projects.

CL 05 is closed.

CL ID	06	**Section no.**	B.6.1	**Date: 26/08/2022**

Description of CL

In section B.6.1 of PDD, for BE calculation, why project can use the Developed countries $B_{0,LT}$ values is not clarified.

Project developer response **Date:** 09/09/2022

PP have corrected the related contents as follows: According to applied methodology ACM0010(Version 08.0), 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).

The proposed project is located in Hubei Province, China, Asia. According to Table 10A-7 and 10A-8 of IPCC 2006 Guidelines for National Greenhouse Gas Inventories volume 4, chapter10, 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.

Documentation provided by project developer

/1/ version 04	
VVB assessment	**Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that the initial description is wrong and has been updated in the PDD. 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)/34/. 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 Hubei 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, chapter10/34/. CL 06 is closed.	

CL ID	07	**Section no.**	B.6.1	**Date: 26/08/2022**
Description of CL				
In section B.6.1 of PDD, for PE calculation, 1. For the calculation of project emissions from flaring of biogas, in step 1, which option is selected to calculate the mass flow of the residual biogas for flaring as per "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" is not clarified. 2. For the calculation of project emissions from flaring of biogas, in step 2, the flare type is not correct, and the value of flare efficiency need to be re-defined as per the tool. 3. For parameter $\rho_{i,t}$, $\eta_{flare,m}$ and $MS\%_j$, they are not listed in ex ante fixed parameter tables or monitored parameter tables as per the methodology and tool, clarification is requested.				
Project developer response				**Date:** 09/09/2022
1. Option A is adopted to calculate the mass flow of the residual biogas for flaring as per Too 08 "Tool to determine the mass flow of a greenhouse gas in a gaseous stream". The details description sees section B.6.1. 2. The flare in this project belongs to open flares. According to Tool 06 paragraph 18: in the case of open flares, the flare efficiency in the minute m (ηflare,m) is 50% when the flame is detected in the minute m (Flamem), otherwise ηflare,m is 0%. Since the flame is not detected in the minute, therefore, fixed value of 0% for the flare efficiency will be applied for this project, and this is for conservative. 3. The parameter $\eta_{flare,m}$ have been listed in ex ante fixed parameter tables, the parameter $\rho_{i,t}$, and $MS\%_j$ have been listed in monitored parameter tables.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI verified that the option A has been selected to calculate the mass flow of the residual biogas for flaring as per "Tool to determine the mass flow of a greenhouse gas in a gaseous stream" in step 1 of project emissions from flaring of biogas. Refer to section D.3.6 of this report for detail assessment of the project emissions from flaring. 2. The revised PDD is checked, CTI verified that the flare type has been updated with the actual installed type as open which is confirmed as actual via site inspection and related value of flare efficiency has been chosed in line with the tool. Refer to section D.3.6 of this report for detail assessment of the project emissions from flaring. 3. The revised PDD is checked, CTI verified that the parameters $\rho_{i,t}$, $\eta_{flare,m}$ and $MS\%_j$ have been listed as ex ante fixed parameter tables or monitored parameter tables. Refer to section D.3.6 of this report for detail assessment of the project emissions from flaring. CL 07 is closed out.				

CL ID	08	**Section no.**	B.6.1	**Date: 26/08/2022**
Description of CL				
For parameter $NEX_{LT,y}$, it is not listed monitored parameter tables as per the methodology.				
Project developer response				**Date:** 09/09/2022
The parameter $NEX_{LT,y}$ have been listed in monitored parameter tables.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
The revised PD is checked, CTI confirmed that the parameter has been added which is confirmed in line with the requirement of the applid methodology. CL 08 is closed.				

CL ID	09	Section no.	B.7.1	Date: 26/08/2022
Description of CL				
For parameter $N_{p,LT}$, 1. The ex ante data source is missing. 2. As per the methodology, "The PDD should describe the system on monitoring the number of livestock produced", however, no system on monitoring is clarified.				
Project developer response				**Date:** 09/09/2022
1. The ex ante data source is Feasibility Study Report. 2. The system is described as follows: Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals, can track automatically. This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. Therefore, the number of swine produced in the farm can be monitored through the auto tracking devices of electronic ear tag once pig slaughter monthly and obtained by the DCS. At the same time, the technicians in farms will be recorded in the "Export record form of Market swine".				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PD is checked, CTI confirmed that ex ante data source is added. 2. The revised PD is checked, CTI confirmed that the PDD has described the system on monitoring the number of livestock produced. Refer to section D.3.7 of this report for detail assessment. CL 09 is closed.				

CL ID	10	Section no.	B.7.1	Date: 26/08/2022
Description of CL				
For parameter $N_{da,LT}$, 1. The ex ante data source is missing. 2. As per the methodology, "The PDD should describe the system on monitoring the number of days", however, no system on monitoring is clarified. For parameter T_t and P_t 3. The ex ante data source is not relevant.				
Project developer response				**Date:** 09/09/2022
For parameter $N_{da,LT}$, 1.The data source is Feasibility Study Report. 2. The system is described as follows: Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals. This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. Therefore, the days of swine alive in the farm can be traced through the electronic ear tag by the technical staff in each farm and obtained by the DCS and the data can be sourced from the "production record of Market swine". For parameter T_t and P_t 3. 293.15K was used in the pre-calculation for the density of CH_4 as the applied methodology ACM0010 (Version 08.0), 101,325 Pa for the pre-calculation for the density of CH_4 as the applied methodology ACM0010 (Version 08.0).				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PD is checked, CTI confirmed that ex ante data source is added. 2. The revised PD is checked, CTI confirmed that the PDD has described the system on monitoring the number of days. 3. The revised PD is checked, CTI confirmed that the ex ante data source has been updated. Refer to section D.3.7 of this report for detail assessment. CL 10 is closed.				

CL ID	11	Section no.	B.7.1	Date: 26/08/2022
Description of CL				

For parameter $N_{AA,LT}$,
1. Parameter name is not correct.
2. The ex ante data source is missing.
3. As per the methodology, “The PDD should describe the system on monitoring the number of livestock population”, however, PD only list the request but not provided actual system on monitoring.
4. Auto device is not clarified for monitoring the population.

Project developer response	**Date:** 09/09/2022

1. The Parameter name is $N_{AA,LT}$ not N_{AA}, which has modified.
2.The ex ante data source is Feasibility Study Report.
3. The system is described as follows: Each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the identification and electronic management of animals. This electronic ear tag will be connected to the Data Collection System (DCS), which can store and read information. The technicians in farms monitor and record the number of breeding swine in “Breeding Swine stock record” through the auto tracking devices of electronic ear tag daily, of which new imported animals are included and dead and discharge animals are excluded. The annual average number of animals ($N_{AA,LT}$) is calculated as an average of the daily stock of market and breeding swine in the farms without considering dead animals and discarded animals.
4. The project proponents monitor the population of breeding pigs through the auto device, which is connected to the Data Collection System (DCS). Therefore, the data of $N_{AA,\ LT}$ can be obtained through DCS.

Documentation provided by project developer

/1/ version 04

VVB assessment	**Date: 19/09/2022**

1. The revised PD is checked, CTI confirmed that name is corrected in line with the applied methodology.
2. The revised PD is checked, CTI confirmed that ex ante data source is added.
3. The revised PD is checked, CTI confirmed that the PDD has described the system on monitoring the number of days.
4. The revised PD is checked, CTI confirmed that project proponents monitor the population of breeding swine through the auto tracking device connected to the Data Collection System (DCS) which has been verified by site inspection.

Refer to section D.3.7 of this report for detail assessment.
CL 11 is closed.

CL ID	12	**Section no.**	B.7.1	**Date: 26/08/2022**

Description of CL

For parameter W_{site},
1. The ex ante data source is missing.
2. As per the methodology, “The PDD should describe the system of random sampling taking into account stratification of each livestock population into a minimum of three weight categories as described above”, however, the related information is not clarified.

Project developer response	**Date:** 09/09/2022

1.The ex ante data source is Feasibility Study Report.
2. The sampling procedures and method is described in Section B.7.2 of PDD.

Documentation provided by project developer

/1/ version 04
/6/

VVB assessment	**Date: 19/09/2022**

1. The revised PD is checked, CTI confirmed that ex ante data source is added/6/.
2. The revised PD is checked, CTI confirmed that the system of random sampling taking into account stratification of each livestock population into a minimum of three weight categories has been described in the PDD and verified in line with the request of the methodology.

Refer to section D.3.7 of this report for detail assessment.
CL 12 is closed.

CL ID	13	**Section no.**	B.7.1	**Date: 26/08/2022**

Description of CL

For parameter F_{Aer}, 1. This parameter should be a monitored parameter as per the methodology but listed in the ex ante fixed tables. 2. The ex ante data source is missing. For parameter v_f, 3. The applied value is not correct and source is missing. 4. How to measure the value is not clarified. 5. Purpose of data is not correct as per the applied methodology.
Project developer response **Date:** 09/09/2022
For parameter F_{Aer}, 1.The parameter FAer has been moved to monitored parameter. 2. The ex ante data source is Feasibility Study Report. For parameter vf, 3. The applied value is 31,354,493m^3, which has been modified, and the sourced is Feasibility Study Report. 4. This parameter measured by flowmeters. 5. The purpose of this data is to calculated CH_4 generated in the anaerobic digester in the project situation $Q_{CH4,y}$
Documentation provided by project developer
/1/ version 04 /6/
VVB assessment **Date: 19/09/2022**
1. The revised PD is checked, CTI confirmed that the parameter of F_{Aer} has been moved to section B.7.1 Data and parameters to be monitored which is confirmed in line with the tool. 2. The revised PD is checked, CTI confirmed that ex ante data source is added/6/. 3. The revised PD is checked, CTI confirmed that the applied value has been changed based on the FSR/6/ and data source is added. 4. The revised PD is checked, CTI confirmed that the measurement method has been added which is confirmed as correct and actual via site inspection. 5. The revised PD is checked, CTI confirmed that the purpose of data is correct as per the applied methodology. Refer to section D.3.7 of this report for detail assessment. CL 13 is closed.

CL ID	14	**Section no.**	C.1.1	**Date: 26/08/2022**
Description of CL				
Why the date on signing the Equipment purchase contract is defined as per the definition of start date given in the GS4GG Principles and Requirements is not clarified and which equipment need to be clarified.				
Project developer response				**Date:** 09/09/2022
According to “Principles & Requirements (version 1.2)”, the project start date is defined as: Examples of the start date may include the date on which contracts have been signed for equipment or construction/operation services required for the Project. Minor pre-project expenses, such as the contracting of services/payment of fees for feasibility studies or preliminary surveys, shall not be considered in the determination of the start date as they do not necessarily indicate the commencement of implementation of the Project. For distributed technology projects, the start date is the date of implementation of the first unit under the project. This project is not a distributed technology project, so the start date of this project is the date on which contracts have been signed for equipment or construction/operation services required for the Project. The earliest purchase date of the biogas generator of the project is 09/09/2020, so the Start date of project is 09/09/2020.				
Documentation provided by project developer				
/1/ version 04 /10/				
VVB assessment				**Date: 19/09/2022**
The revised PD is checked, CTI confirmed that the clarification has been added. The start date of the project is 09/09/2020 which is the date on signing the Equipment (biogas generators) purchase contract/10/. The assessment team has reviewed the Equipment (biogas generators) purchase contract/10/ and found date is correct and this is the earliest date on which contracts have been signed for equipment or construction/operation services required for the Project confirmed in line with the start date definition in “Principles & Requirements (version 1.2)”/47/. CL 14 is closed.				

Table 3. CAR from this validation

CAR ID	01	Section no.	A.2	Date: 26/08/2022
Description of CAR				
For the project location, 1. The host party name is missing. 2. The type of the farm is missing. 3. The Chinese name of each swine farm is missing. 4. The geographical coordinates of each farm is not accurate.				
Project developer response				**Date:** 09/09/2022
1. The host party is China, which has added to Section A.2. 2. There are 9 subsidiary farms involved in the project, 9 swine farm including market swine and breeding swine: Yongjiahes wine farm, Zhoujiachong swine farm, Jiucaiyuan swine farm, Gaoshanmiao swine farm, Shayang 1st phase swine farm, Shayang 2nd phase swine farm, Ezhou swine farm, Tuchong swine farm and Sangzihu swine farm.. 3.The Chinese name of each swine farm has been added. 4. The geographical coordinates of each farm has been corrected. Please refer to Section A.2 of PDD.				
Documentation provided by project developer				
/1/ version 04 /6/				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the host party name is added which is correct. 2. The revised PDD is checked, CTI confirmed that types of the farms are provided which is verified as correct by site visit. 3. The revised PDD is checked, CTI confirmed that the Chinese name of each swine farm is added and verified as correct by site visit and checking the FSR/6/ 4. The revised PDD is checked, CTI confirmed that the geographical coordinates of each farm is updated to be accurate which is verified as correct by site visit using the GPS device. CAR 01 is closed.				

CAR ID	02	Section no.	A.3	Date: 26/08/2022
Description of CAR				
1. The commissioning started date of each farm is not provided. 2. Baseline scenario is missing and if any baseline equipment existed is not specified.				
Project developer response				**Date:** 09/09/2022
1. the operation date of each farm has been added in Section A.3 of PDD. 2. Prior to the implementation of the project, all manure waste produced from the 9 existing swine farms was left to decay in 9 uncovered anaerobic lagoons at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. As per "technical specification for sanitation treatment of livestock and poultry manure", In China, the uncovered anaerobic lagoon is a kind of manure treatment method recognized by the state. In addition, there is no legal regulation to mandate the livestock farm owners to implement anaerobic digestion, aerobic or other biological treatment techniques and to capture and/or utilize methane generated at these lagoons. After the implementation of the project, original 9 uncovered anaerobic lagoons had been removed, the volume for original uncovered anaerobic lagoons is described in Section A.3 of PDD.				
Documentation provided by project developer				
/1/ version 04 /6/ /9/ /10/ /13/ /16/				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the commissioning started date of each farm has been added into PDD which is verified as correct by checking the FSR/6/ and Licenses for production and operation of the breeding livestock and poultry/9/ for each swine farm. The project start date is 09/09/2020 which has been confirmed by checking the equipment purchase contracts/10/, and was put into operation on 01/01/2021 which has been confirmed by checking the operation log of the project/13/ and record of operation started/16/. 2. The revised PDD is checked, CTI confirmed that the baseline scenario and existing equipment has been clarified which is confirmed as correct and actual via site inpection and checking the FSR/6/. CAR 02 is closed.				

CAR ID	03	**Section no.**	A.3	**Date: 26/08/2022**
Description of CAR				
The Process flow of biogas project in the swine farms is figure 1 is not correct as below findings, 1. The equipment are not completed. 2. The productions are not completed. 3. Power generation and utilization is missing in the process.				
Project developer response				**Date:** 09/09/2022
1. The Process flow of biogas project in the swine farms of figure 2 has been modified to include all the equipment. 2. The Process flow of biogas project in the swine farms of figure 2 has been modified to include all the productions. 3. The power generation and utilization has been included in figure 2.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the flow chart has been updated with the all the equipment listed which is verified as actual by site inspection. 2. The revised PDD is checked, CTI confirmed that the flow chart has been updated with the all the productions listed which is verified as actual by site inspection. 3. The revised PDD is checked, CTI confirmed that the power generation and utilization process has been added into the boundary which is verified as actual by site inspection and in line with the applied methodology. CAR 03 is closed.				

CAR ID	04	**Section no.**	A.3	**Date: 26/08/2022**
Description of CAR				
1. The description of main equipment and constructions involved in the project is missing. 2. The technical parameters of main equipment and constructions are missing.				
Project developer response				**Date:** 09/09/2022
1. The description of main equipment and constructions has been added to section A.3. 2. The technical parameters of main equipment and constructions has been added to table 3 of PDD.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the description of main equipment and constructions has been added. 2. The revised PDD is checked, CTI confirmed that the technical parameters of main equipment and constructions are added accordingly. Refer to section D.2 of this report for detail assessment. CAR 04 is closed.				

CAR ID	05	**Section no.**	B.1&B.2	**Date: 26/08/2022**
Description of CAR				
1. In section B.1, Tool 24 “Common practice (Version 03.1)” is not provided. 2. The applicability demonstration of Tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)” and Tool 24 “Common practice (Version 03.1)” are not provided in section B.2.				
Project developer response				**Date:** 09/09/2022
1. The tool 24 “Common practice (Version 03.1)” has been added to section B.1. 2. The applicability demonstration of Tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (version 03.0)” and Tool 24 “Common practice (Version 03.1)” have been added to section B.2 of PDD.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that the applied tool have been provided. Refer to section D.3.1 of this report for detail assessment. CAR 05 is closed.				

CAR ID	06	**Section no.**	B.3	**Date: 26/08/2022**

Description of CAR	
For the project boundary 1. The actual project boundary of the project is not stated clearly according to the applied methodology. 2. The project process in the boundary of the project in figure 4 does not in line with the actual situation of each AWMS in each farm.	
Project developer response	**Date:** 09/09/2022
1. The proposed project boundary considers the GHG emissions that come from AWMSs, including the GHG from the anaerobic digestion, GHG emissions from sludge treatment by aerobic composting and GHG emissions from flaring system in 9 swine farms. 2. Project process in the boundary of the project in figure 4 has been corrected to in line with the actual situation of each AWMS in each farm.	
Documentation provided by project developer	
/1/ version 04	
VVB assessment	**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the project boundary has been completed accordingly. 2. The revised PDD is checked, CTI confirmed that project process in the boundary listed in Figure 3 is correct. Refer to section D.3.3 of this report for detail assessment. CAR 06 is closed.	

CAR ID	07	Section no.	B.4	Date: 26/08/2022
Description of CAR				
In section B.4 of PDD, for step 1, 1. The demonstration of alternative 6 is not reasonable and farm number is not correct. 2. The demonstration of alternative 8 is not accurate and complete based on the actual situation of the project. 3. The demonstration of alternative 17 is not accurate and complete based on the actual situation of the project. 4. Step 1b is missing. 5. Step 2 is not stated in line with the applied Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0).				
Project developer response				**Date:** 09/09/2022
1. The demonstration of alternative 6 has been modified as: As per “Technical specification for sanitation treatment of livestock and poultry manure”, the uncovered anaerobic lagoon is a kind of harmless treatment of manure. After being treated in the uncovered anaerobic pond, the manure can be used for agricultural irrigation, Prior to the implementation of the project, the animal manure waste was left to decay in uncovered anaerobic lagoons. Therefore, animal waste that has been treated by uncovered anaerobic lagoon can satisfy the above regulations. Since there is no legal regulation to mandate the livestock farm owners to implement anaerobic digestion, aerobic or other biological treatment techniques and to capture and/or utilize methane generated at these lagoons. So, the uncovered anaerobic lagoon is a alternatives baseline scenario. 2. The demonstration of alternative 8 has been modified as: A single Anaerobic digester is suitable for treating manure, but to implement such technology need high invest compared to Uncovered anaerobic lagoon, which is the most common and economic method. However, 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. At present a combine Anaerobic Digester-Aerobic Treatment system is considered to be 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 GS VER project. 3. The demonstration of alternative 17 has been modified as: A single aerobic treatment technique is not suitable for treating low concentration organic wastewater in wastewater. This kind of wastewater contains a large amount of highly concentrated organic wastewater, which is difficult to be treated by the aerobic method and does not meet the Chinese environmental quality standards and pollutant discharge standards for discharge to water bodies. At present, a combine anaerobic digester-aerobic treatment system is considered to be 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 GS VER project. 4. The description of step 1b has been added to section B.4 of PDD by PP. 5. Step 2 is Barrier analysis which has been stated in line with the Tool 02 by PP.				
Documentation provided by project developer				
/1/ version 04				

VVB assessment	Date: 19/09/2022
1. The revised PDD is checked, CTI confirmed that the alternative 6 has been updated as plausible. 2. The revised PDD is checked, CTI confirmed that the alternative 8 has been updated as accurate and complete. 3. The revised PDD is checked, CTI confirmed that the alternative 17 has been updated as accurate and complete. 4. The revised PDD is checked, CTI confirmed that the step 1b has been provided. 5. The revised PDD is checked, CTI confirmed that Step 2 has been stated in line with the applied Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0). Refer to section D.3.4 of this report for detail assessment. CAR 07 is closed.	

CAR ID	08	Section no.	B.4	Date: 26/08/2022
Description of CAR				
1. In section B.4 of PDD, for step 3, the investment analysis for scenario 6 is not provided. 2. In section B.4 of PDD, for step 3, the investment analysis for project scenario is not provided. 3. In section B.4 of PDD, for step 3, the data source for Basic parameters is not correct. 4. Guidance on the Assessment of Investment Analysis is not valid which should be updated as the related tool. 5. The sensitivity analysis is not completed, the actual investment for the project is not used to comparing with the estimated value from FSR. 6. In section B.4 of PDD, the conclusion of setion B.4 is not correct due to this part is determination of baseline scenario, not the additionality, the identified baseline scenario is not provided accordingly.				
Project developer response				**Date:** 09/09/2022
1. The investment analysis for scenario 6 has been added to section B.4 of PDD. 2. The investment analysis for project scenario has been added to section B.4 of PDD. 3. for step 3, the data source for Basic parameters is Feasibility Study Report. 4. The Guidance on the assessment of Investment Analysis has been modified as Tool 27" Investment Analysis" (Version 11.0). 5. The sensitivity analysis of total static investment has been modified as follows: According to the publicly latest available sources, on the whole, the price indices for steel, fuel, power and construction materials and price indices for fixed asset investment in China have been increasing in the past years. Besides, as per general contract of engineering construction and purchase agreement of the main equipment (power generator, anaerobic tanks, turnover machines and flaring system), the actual investment costs of the project have reached to $11,952.26*10^4$RMB/MW, which is higher than estimated value of $11,599.47*10^4$RMB in FSR/6/. 6. The conclusion of section B.4 has been correct as follows: In summary, the NPV of both the project activity without GS VER revenues and the uncovered anaerobic lagoon are negative and the NPV of the project activity without GS VER revenues is far more negative than that of the uncovered anaerobic lagoon which means the cost of the project activity without GS VER revenues is much higher than the uncovered anaerobic lagoon, so the uncovered anaerobic lagoon is the most attractive course of action and is considered to be the baseline scenario.				
Documentation provided by project developer				
/1/ version 04 /6/				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that investment analysis for scenario 6 is added. 2. The revised PDD is checked, CTI confirmed that nvestment analysis for project scenario is provided. 3. The revised PDD is checked, CTI confirmed that data source for Basic parameters is updated as FSR/6/ which is verified as correct. 4. The revised PDD is checked, CTI confirmed that Guidance on the Assessment of Investment Analysis has been updated to the methodological tool 27" Investment Analysis" (Version 11.0) which is verifired as correct and relevant. 5. The revised PDD is checked, CTI confirmed that the sensitivity analysis is updated, the actual investment for the project has been used to comparing with the estimated value from FSR. 6. The revised PDD is checked, CTI confirmed that additionality analysis has been moved to the section B.5 Demonstration of additionality. Refer to section D.3.4 of this report for detail assessment. CAR 08 is closed.				

CAR ID	09	Section no.	B.4	Date: 26/08/2022

Description of CAR	
In section B.4 of PDD, for common practice justification, 1. This part should be in section B.5. 2. Methodological tool: “common practice (version 03.1)” is not listed. 3. The similar project is not defined as per the step 2 of the tool “common practice (version 03.1)”. 4. The data source for identify N_{all} is not provided.	
Project developer response	**Date:** 09/09/2022
1. The common practice justification has been moved to section B.5 of PDD by PP. 2. Methodological tool: “common practice (version 03.1) has been listed. 3. The similar project has been defined as per the step 2 of the tool “common practice (version 03.1)”, the definition is the project belonging to “Methane formation avoidance” with treatment of manure operated before 09/09/2020, that can handle manure from 261,287.5 tons to 783,862.5 tons annually in Hubei Province. 4. The data source for identify N_{all} is UNFCC website, CDM website, China CER exchange info-platform, GS website, VCS website, local DRC of Hubei Province website and Department of Agriculture and rural affairs of Hubei Province.	
Documentation provided by project developer	
/1/ version 04	
VVB assessment	**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the common practice analysis has been moved to section B.5. 2. The revised PDD is checked, CTI confirmed that the “common practice (version 03.1)” has been used for demonstrate the common practice. 3. The revised PDD is checked, CTI confirmed that Swine Farm Animal Manure Management System GHG Mitigation project with delivery power operated before 09/09/2020 that can handle manure from 261,287.5 tons to 783,862.5 tons annually in Hubei Province is defiend as the similar project as the proposed project activity which is verified as correct and in line with the step 2 of the tool “common practice (version 03.1)”. 4. The revised PDD is checked, CTI confirmed that data source for identify N_{all} has been provided. Refer to section D.3.5 of this report for detail assessment. CAR 09 is closed.	

CAR ID	10	Section no.	B.6.1	Date: 26/08/2022
Description of CAR				
In section B.6.1 of PDD, 1. For parameter GWP_{CH4}, the source of data is not accurate. 2. For parameter GWP_{N2O}, the source of data is not accurate. 3. For parameter $F_{gas\ MS,j,LT}$, value applied is not completed for anaerobic lagoon and solid storage. 4. For parameter $EF_{CH4,default}$, Source of data is not correct and What is UASB type digester is not specified and supporting evidence is not clarified as per request of applied methodology.				
Project developer response				**Date:** 09/09/2022
1. For parameter GWP_{CH4}, the source of data is IPCC Fifth Assessment Report. 2. For parameter GWP_{N2O}, the source of data is IPCC Fifth Assessment Report. 3. For parameter $F_{gas\ MS,j,LT}$, value applied for anaerobic lagoon and solid storage are 40% and 45%, respectively. 4. For parameter $EF_{CH4,default}$, Source of data is tool 14:” Project and leakage emissions from anaerobic digesters (version 02.0)”, As per tool 14:” project and leakage emission from anaerobic digesters (version 02.0)”, the value this parameter should be determined according to the type of digester used in the project activity and the digester type shall be identified by manufacturer information. For this project, as per the purchasing contract of Anaerobic digester, the type of digester used in the project activity belongs to UASB type digester, so the Default emission factor for the fraction of CH_4 produced that leak from the anaerobic digester (fraction) is 0.05 t CH_4 leaked / t CH_4 produced.				
Documentation provided by project developer				
/1/ version 04 /10/ /6/				
VVB assessment				**Date: 19/09/2022**

1. The revised PDD is checked, CTI confirmed that the source of data and values for GWP_{CH4} has been updated to be correct and accurate.
2. The revised PDD is checked, CTI confirmed that the source of data and values for GWP_{N2O} has been updated to be correct and accurate.
3. The revised PDD is checked, CTI confirmed that the $F_{gas\ MS,j,LT}$ values applied have been listed for both anaerobic lagoon and solid storage.
4. The revised PDD is checked, CTI confirmed that explanation has been added in the PDD which is verified as correct by checking the equipment purchase contract/10/ and FSR/6/.

Refer to section D.3.6 of this report for detail assessment.
CAR 10 is closed.

CAR ID	11	**Section no.**	B.6.1	**Date: 26/08/2022**
Description of CAR				
1. For parameter R_u, the source of data is missing. 2. For parameter MM_i, the source of data is missing.				
Project developer response				**Date:** 09/09/2022
1. The source of data for parameter R_u is tool 08:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)". 2. The source of data for parameter MM_i is tool 08:" Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)".				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the source of data is added and verified as correct. 2. The revised PDD is checked, CTI confirmed that the source of data is added and verified as correct. Refer to section D.3.7 of this report for detail assessment. CAR 11 is closed.				

CAR ID	12	**Section no.**	B.7.1	**Date: 26/08/2022**
Description of CAR				
1. For parameter $EC_{PJ,j,y}$, the ex ante estimated value is not correct as per the FSR and the cross check method is missing. 2. The parameter Type and T is missing in this section as per the applied methodology. 3. For parameter "The amount of electricity generation by capturing biogas", the actual monitoring method is not clear and QA/QC procedure is missing.				
Project developer response				**Date:** 09/09/2022
1. 0 MWh for ex ante estimation, which sourced from Feasibility Study Report. During the monitoring period, the electricity consumption supplied by the gird company will be determined as per the electricity meters monitoring and cross-check with the grid statement issued by power grid company. 2. The parameter Type and T has been added to section B.7.1. 3. the parameter of "The amount of electricity generation by capturing biogas" has been modified as the "The amount of electricity generation by capturing biogas", and the actual monitoring method is that this parameter was measured by electricity meters installed at the generator outlet. The QA/QC procedure is that the calibration of electricity meters, including the frequency of calibration, should be done in accordance with national standards or requirements.				
Documentation provided by project developer				
/1/ version 04 /6/				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that the value has been updated to be in line with the FSR/6/ and cross check method is provided and in line with the requirement of the tool. 2. The revised PDD is checked, CTI confirmed that the parameter Type and T has been added in this section as per the applied methodology. 3. The revised PDD is checked, CTI confirmed that the actual monitoring method has been provided as clear and monitoring frequency is consistent with the name of the parameter. Refer to section D.3.7 of this report for detail assessment. CAR 12 is closed.				

CAR ID	13	**Section no.**	B.7.2	**Date: 26/08/2022**
Description of CAR				

In section B.7.2 of PDD, for sampling plan, as per the methodology, for the sampling method to W_{site}, to ensure representativeness, each defined livestock population should be classified into a minimum of three age categories, however, related information is missing. Age categories are not defined.
Project developer response **Date:** 09/09/2022
According to the methodology" ACM0010" GHG emission reductions from manure management systems (Version 08.0)", each defined livestock population should be classified into a minimum of three age categories; The three age categories of marketing swine are classified according to the age in days, i.e. Nursery phase with 30-60days, Growing phase with 60-130days and Mature phase with 130-180days. The three age categories of breeding swine are classified according to the age in days, i.e. Nursery phase with 30-70days, Growing phase with 70-220days and Mature phase with 220-310days
Documentation provided by project developer
/1/ version 04
VVB assessment **Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that the age categories have been defined which is verified in line with the applied methodology. Refer to D.3.7 in this report for detail assessment. CAR 13 is closed.

CAR ID	14	**Section no.**	B.7.2	**Date: 26/08/2022**
Description of CAR				
In section B.7.2 of PDD, for sampling plan 1. The detail information of Stratified random sampling is not specified related to the 9 swine farms and involved swine population. 2. The detailed sampling method and process is not specified related to the request of a minimum of one monthly sample per age category should be taken.				
Project developer response **Date:** 09/09/2022				
1. The detail information of Stratified random sampling is as follows: According to the methodology" ACM0010" GHG emission reductions from manure management systems (Version 08.0)", each defined livestock population should be classified into a minimum of three age categories; The three age categories of marketing swine are classified according to the age in days, i.e., Nursery phase with 30-60 days, Growing phase with 60-130 days and Mature phase with 130-180 days. The three age categories of breeding swine are classified according to the age in days, i.e., Nursery phase with 30-70days, Growing phase with 70-220days and Mature phase with 220-310days. For each defined livestock population, a minimum of one monthly sample per age category should be taken. In this project, the monitoring activities of the Average animal weight of a defined livestock population at the project site will be conducted in the three age groups of Nursery phase, growing phase and mature phase in each swine farm at least one monthly. 2. the detailed sampling method and process is as follows: There are 9 subsidiary farms involved in the project, Of which, there are one fatting farm that only market swine: Debao Chengguan swine Farm, the other swine farm including market swine and breeding swine. As this project involved 9 swine farms and two types of swine i.e., Market swine and Breeding swine, and as per applied methodology, each defined livestock population should be classified into a minimum of three age categories, so the sampling method is Stratified random sampling. The specific sampling methods are as follows: For the sampling, PP should calculate the overall sample size based on the population of pigs in stock firstly. As the project involved 9 swine farms, so the sample size in each swine farm should be determined based on the proportion of the number of each farm in the total number of 9 farms. Similarly, the sample size of each age group of Market swine and Breeding swine in a farm were 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 the farm. After the sample size in each age group of Market swine and Breeding swine of each swine farm determined, the sample can be conducted in every swine farm. Since swine in different age are kept in the different pig houses, samples can be randomly selected from pig houses of this age group. After the samples are selected, the weight is measured by weight measurers and recorded in the weight record table.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment **Date: 19/09/2022**				
1. The revised PDD is checked, CTI confirmed that the detail information of stratified random sampling has been specified. 2. The revised PDD is checked, CTI confirmed that detailed sampling method and process has been specified. Refer to D.3.7 in this report for detail assessment. CAR 14 is closed.				

CAR ID	15	Section no.	B.7.2	Date: 26/08/2022
Description of CAR				
In section B.7.2 of PDD, for sampling plan, the process and equation for determine sampling size is not specified.				
Project developer response				**Date:** 09/09/2022
For sampling plan, the process and equation for determine sample size has been added to section B.7.2 of PDD by PP.				
Documentation provided by project developer				
/1/ version 04 /36/ /37/				
VVB assessment				**Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that calculation of sample size has been described in section B.7.2 which is verified as correct and reasonable via checking the standard and guideline of sampling and survey/36/,/37/. CAR 15 is closed.				

CAR ID	16	Section no.	B.7.3	Date: 26/08/2022
Description of CAR				
For the other elements of the monitoring plan, 1. QA/QC procedure is missing. 2. Data collection and management process is missing 3. Emergency procedure is missing.				
Project developer response				**Date:** 09/09/2022
1. The QA/QC procedure has been added to section B.7.3 by PP. 2. The Data collection and management process has been added to section B.7.3 by PP. 3. The Emergency procedure has been added to section B.7.3 by PP.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
1. The revised PDD is checked, CTI confirmed that QA/QC procedure has added in the monitoring plan 2. The revised PDD is checked, CTI confirmed that data collection and management process has added in the monitoring plan 3. The revised PDD is checked, CTI confirmed that the emergency procedure is added accordingly. Refer to section D.3.7 in this report for detail assessment. CAR 16 is closed.				

CAR ID	17	Section no.	Appendix 1	Date: 26/08/2022
Description of CAR				
The corresponding mitigation measures to the principle 9.5 is not provided in the Appendix 1.				
Project developer response				**Date:** 09/09/2022
The corresponding mitigation measures has been added to the principle 9.5 in Appendix 1.				
Documentation provided by project developer				
/1/ version 04				
VVB assessment				**Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that corresponding mitigation measures to the principle 9.5 has been added. Via on-site inspection, it is verified that the project does not involve any hazardous materials resulting from their production, transportation, handling, storage and use in the Project. However, the risk was identified that the project, methane explosion may be caused if biogas is not handled properly during the operation period. The relate mitigation measures have been provided and added to the Monitoring Plan. The monitoring parameter of Employee Training of biogas safety operation has been listed for monitoring which is confirmed as the proper mitigation measures. CAR 17 is closed.				

CAR ID	18	Section no.	E.1	Date: 26/08/2022
Description of CAR				
In section E.1, the actual situation of stakeholder feedback round is not provided.				
Project developer response				**Date:** 09/09/2022
The actual situation of stakeholder feedback round has been summarized in section E.1 by PD.				

Documentation provided by project developer	
/1/ version 04	
VVB assessment	**Date: 19/09/2022**
The revised PDD is checked, CTI confirmed that the actual situation of stakeholder feedback round is provided. Refer to section D.6 of this report for detail assessment. CAR 18 is closed.	

Table 4. FAR from this validation

FAR ID	N/A	**Section No.**	NA	**Date :** DD/MM/YYYY
Description of FAR				
Project developer response				**Date :** DD/MM/YYYY
Documentation provided by project developer				
VVB assessment				**Date:** DD/MM/YYYY