**Verification report for**
**GS4GG project activities**

**(Gold Standard for the Global Goals)**

| VERICATION AND CERTIFICATION REPORT | |
|---|---|
| **Title of the project activity** | Tieqilishi AWMS GHG Mitigation Project in Sichuan Province |
| **Reference number of the project activity** | GS11712 |
| **Version number of the verification and certification report** | 03 |
| **Completion date of the verification and certification report** | 18/07/2023 |
| **Monitoring period number and duration of this monitoring period** | MP number: first<br>MP dates: 01/01/2022 to 31/12/2022 (both days included) |
| **Version number of monitoring report to which this report applies** | 03 |
| **Crediting period of the project activity corresponding to this monitoring period** | 01/01/2022 to 31/12/2026 (both days included) |
| **Project Representative** | The official focal point and project developer: Sirreon Technology and Development (Beijing) Co., Ltd.<br>The project owner: Sichuan Tieqilishi Food Co., Ltd. |
| **Host Party** | People's Republic of China |
| **Activity Requirements applied** | ☒ Community Services Activities<br>☐ Renewable Energy Activities<br>☐ Land Use and Forestry Activities/Risks & Capacities<br>☐ N/A |
| **Methodology (ies) applied and version number** | ACM0010 "GHG emission reductions from manure management systems" (Version 08.0) |
| **Product Requirements applied** | ☒ GHG Emissions Reduction & Sequestration<br>☐ Renewable Energy Label<br>☐ N/A |
| **SDG Contributions targeted (as per approved PDD)** | Goal 7: Responsible consumption and production<br>Goal 8: Decent work and economic growth<br>Goal 13: Climate Action |
| **Estimated annual amount of SDG impact (as per approved PDD)** | Responsible consumption and production (SDG 7)- 7.2.1 Renewable energy share in the total final energy consumption: Total electricity produced: 51,854 MWh<br>Decent Work and Economic Growth (SDG 8)-: Total number of jobs: 10 |

| | | |
|---|---|---|
| | 8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities | full-time jobs created including 5 males and 5 females |
| | Climate Action (SDG 13)-<br>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: 355,531 $tCO_2e$ |
| **Total amount of certified SDG impact (as per approved methodology) achieved in this monitoring period** | SDG 7 -<br>From 01/01/2022 to 31/12/2022, Total electricity produced: 40,200 MWh<br>In the 1st monitoring period, Total electricity produced: 40,200 MWh<br>SDG 8 –<br>From 01/01/2022 to 31/12/2022, 10 full-time jobs created including 5 males and 5 females.<br>In the 1st monitoring period, 10 full-time jobs created including 5 males and 5 females.<br>SDG 13 –<br>GHG emission Reductions (GS VERs)<br>01/01/2022-31/12/2022 : 290,683 $tCO_2e$<br>1st monitoring period: 290,683 $tCO_2e$ | |
| **Name of VVB** | VVB Name: Shenzhen CTI International Certification Co., Ltd (CTI) | |
| **Name, position and signature of the approver of the verification and certification report** | Lin Wu Wu Lin<br>Technical Reviewer/Approver | |

## SECTION A. Executive summary

The project activity installs new animal waste management systems by replace the current open anaerobic lagoons with 5 new closed anaerobic digesters to a group of 5 swine farms in Sichuan Province, which treat the manure and wastewater from the 5 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. An Animal Manure Management System (AMMS) has been installed in each swine farm respectively which treat the manure and wastewater from the 5 swine farms. The raw materials such as pig manure, urine and washing water are collected, and by Upflow Anaerobic Sludge Bed Reactor (UASB), the biogas generated. The project is expected to produce about $3,989.0149*10^4$ $m^3$ 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 and surplus biogas will be destroyed through the flaring system (if any). The fermented sludge from the aerobic composting system is used to produce 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.

The project activity enables 5 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 estimated emission reduction from the project is 355,531 $tCO_2e$ per year during the renewable 5-year crediting period and the Certified emissions reduction for the current monitoring period from 01/01/2022 to 31/12/2022 is 290,683 $tCO_2e$.

### Scope of Verification

This verification is an independent and objective review and ex-post determination of the monitored reductions in GHG emissions by the VVB. The verification addresses the implementation and operation of the GS PA and tests the data and assertions set out in the monitoring report based on the following:

(i) The GS PDD of the project/3/
(ii) The approved methodology mentioned in the PDD, ACM0010 “GHG emission reductions from manure management systems” (Version 08.0)/32/
(iii) The registered SDG monitoring parameters in the PDD
(iv) the Gold Standard for the Global Goals Principles and Requirements/43/,
(v) the Gold Standard for the Global Goals Safeguarding Principles & Requirements/44/,
(vi) the Gold Standard for the Global Goals Community Services Activity Requirements/45/,
(vii) the Gold Standard for the Global Goals Stakeholder Consultation and Engagement Requirements/46/,
(viii) Validation and Verification Body requirements, Product requirements and references relevant to the project activity’s reported emission reductions

The verification has considered both quantitative and qualitative aspects on stated/reported emission reductions. The monitoring report (all versions) and corresponding supporting documentation was assessed in accordance with the rules defined by GS4GG, as appropriate to the PA. The verification is not meant to provide any consulting or recommendations to the PP/others. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the monitoring activities.

### Verification process

The verification has been performed as described in the Gold Standard for the Global Goals Principles and Requirements/43/ as below process,

a. Desk review of the GS MR (version 01 dated 04/01/2023)/1/, ER sheet/2/ and the relevant documents
b. On-site assessment (08/01/2023~10/01/2023)
c. Issuance of draft verification report & verification protocol
d. Desk review of the revised MR and related documents
e. Resolution of the raised CAR
f. Issuance of the final verification report
g. Independent technical review of the draft verification report and final/revised documentation (e.g., Monitoring Report, corresponding ER sheet and evidences)
h. Reporting and closure of TR comments/findings and final approval for the decision made
i. Issuance of final verification report to contracted PP (or authorized representatives) and submission of request for issuance, as appropriate.

### Conclusion

CTI has performed the verification of the GS PA "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" having GS Ref. Number GS11712 for the 1st monitoring period from 01/01/2022 to 31/12/2022. The verified emission reductions amount to 290,683 $tCO_2e$ in the aforesaid monitoring period.

The technical parameters of the main equipment are consistent with the PDD, and not changed since validation/4/.

In CTI's opinion, the GHG emission reductions reported for the project in the GS4GG 1st monitoring report are fairly stated. CTI confirmed that each SDG Impacts were calculated correctly on the basis of the approved CDM monitoring methodologies ACM0010. Ver. 08.0/32/ and the monitoring plan contained in the PDD/3/.

CTI confirms that each SDG Impacts are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that each SDG Impacts are appropriately calculated, CTI is able to certify that each SDG Impact from the project "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" during the indicated monitoring period. Therefore, this is being submitted for request for issuance, as per GS procedures as applicable.

## SECTION B. Verification team, technical reviewer and approver

### B.1. Verification 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 & Verifier | IR | Lin | Shunrong | CTI | √ | √ | √ | √ |

### B.2. Technical reviewer and approver of the verification and certification 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 | Lin | Wu | CTI |

## SECTION C. Application of materiality

### C.1. Consideration of materiality in planning the verification

| No. | Risk that could lead to material errors, omissions or misstatements | Assessment of the risk | | Response to the risk in the verification plan and/or sampling plan |
|---|---|---|---|---|
| | | Risk level | Justification | |
| 1. | Human error in the quantification of emissions | Low | Human error is likely to occur if personnel are unfamiliar with, or not well trained regarding, emissions processes or data recording | Depending on the monitoring period being verified, conduct increased verifying during the months when there is a greater likelihood of errors and issues with data quality control due to project participants' leave schedules |
| 2. | Undue reliance on a poorly designed information system, which may have few effective quality controls | Low | Use of spreadsheets without adequate controls related to data changes/updates, version tracking, traceability, security | Depending on how data is generated, processed, and reported, place greater emphasis on verifying data captured and processed manually and/or in spreadsheets versus those that are generated from an automated system |
| 3. | Omissions and misstatements in data transfer from hand written notes into digital Excel ER spreadsheet | Medium | Ineffective quality control of data transfer due to unclear QA/QC procedure | Check QM procedure/manual. PP may demonstrate how to transfer data and how this is crosschecked. Conduct interview with related personnel whether procedure is actually conducted but not adequately described. |

On the basis of the risk analysis the verification has been planned. A detailed audit/verification plan has been prepared and submitted to the project participant(s) in due time before the site visit.

### C.2. Consideration of materiality in conducting the verification

The errors identified in the project are below the threshold limit of materiality and hence not material. The GHG emission reductions are calculated without material misstatements.

## SECTION D. Means of verification

### D.1. Desk review

Desk review of all documents provided by PP and publicly available documents relevant for the verification including monitoring plan, monitoring report, monitoring methodology, project design document, applicable tools in particular attention to the frequency of measurements, QA/QC procedures and other relevant documents was conducted by CTI.

The main documents are listed below:

(i) the GS4GG Monitoring Report Version 01 dated 04/01/2023/1/
(ii) the emission reduction calculation spreadsheet related to this monitoring period/2/.
(iii) the last revision of the PDD including the monitoring plan/3/,
(iv) the last revision of the GS validation report/4/,

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

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

### D.2. On-site inspection

| **Duration of on-site inspection:** 08/01/2023~10/01/2023 | | | | |
|---|---|---|---|---|
| **No.** | **Activity performed on-site** | **Site location** | **Date** | **Team member** |
| 1. | Opening meeting<br>Interview with Representatives of PD, Project Owner, local residents and officers | Office of Sichuan Tieqilishi Food Co., Ltd. in Sichuan Province, China | 08/01/2023 | Lin Shunrong |
| 2. | On-site inspection of the 5 swine farms with their AWMSs and Interview with chief and operation staffs of farms and animal manure management systems | 5 swine farms and their AWMSs in Sichuan Province, P.R. China | 08/01/2023~ 10/01/2023 | Lin Shunrong |
| 3. | Documents check as per the list in Appendix 3 of this report | Office of Sichuan Tieqilishi Food Co., Ltd. in Sichuan Province, China | 10/01/2023 | Lin Shunrong |
| 4. | Findings Summary and discussion with PD | Office of Sichuan Tieqilishi Food Co., Ltd. in Sichuan Province, China | 10/01/2023 | Lin Shunrong |
| 5. | Close Meeting and issuance of findings/draft report | Office of Sichuan Tieqilishi Food Co., Ltd. in Sichuan Province, China | 10/01/2023 | Lin Shunrong |

### D.3. Interviews

#### D.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. | Wu | Jianye | Sichuan Tieqilishi Food Co., Ltd. – Project Owner/ Director of Environment department | 08/01/2023~ 10/01/2023 | Discussion on project financials, project design and implementation, Main equipment, Technical parameters, Baseline, Additionality, Project boundary, Monitoring plan, | Lin Shunrong |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | Monitoring devices, SDG impacts, ER calculation, Local legislation to biogas | |
| 2. | Wu | Song | Sirreon Technology and Development (Beijing) Co., Ltd/ Project Manager | 08/01/2023~ 10/01/2023 | Ex-ante and monitoring parameters and SDG parameters, PDD, MR, SCR and ER, NPV editable issues | Lin Shunrong |
| 3. | Cao | Yu | Xingfu Swine Farm /Chief | 08/01/2023 | 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 | Lin Shunrong |
| 4. | Luo | Xin | Tianchen Swine Farm/Staff | 09/01/2023 | | |
| 5. | Zhong | Xiaoxia | Changyun Swine Farm/Staff | 09/01/2023 | | |
| 6. | Bai | Bin | Huayuan Swine Farm/Staff | 10/01/2023 | | |
| 7. | Sun | Lecheng | Lingxing Swine Farm/Staff | 10/01/2023 | | |
| 8. | Tang | Yawang | Xingfu Swine Farm / AWMS operation staff | 08/01/2023 | 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 | Lin Shunrong |
| 9. | Hao | Haiyun | Tianchen Swine Farm/ AWMS operation staff | 09/01/2023 | | |
| 10. | Mao | Peiyu | Changyun Swine Farm/ AWMS operation staff | 09/01/2023 | | |
| 11. | Lin | Haosi | Huayuan Swine Farm/ AWMS operation staff | 10/01/2023 | | |
| 12. | Fang | Silin | Lingxing Swine Farm/ AWMS operation staff | 10/01/2023 | | |
| 13. | Liang | Leyi | Local Stakeholders/ Residents | 08/01/2023 | Local Stakeholder Consultation issues, SDG impacts Local environment impact | Lin Shunrong |
| 14. | Wu | Yongchang | | 08/01/2023 | | |
| 15. | Ren | Ziyi | | 09/01/2023 | | |
| 16. | Jiang | Zhize | | 09/01/2023 | | |
| 17. | Su | Shiwen | | 10/01/2023 | | |
| 18. | Meng | Ming | | 10/01/2023 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 19. | Long | Hongyu | | 10/01/2023 | | |
| 20. | Pan | Ying | | 10/01/2023 | | |
| 21. | Zheng Feixiang | Zheng Feixiang | Environmental Protection Bureau of Sichuan Province /Local officer | 08/01/2023 | Baseline Scenario Local Stakeholder Consultation issues, SDG impacts, Inputs, Grievances mechanism, Local legislation to swine and biogas | Lin Shunrong |
| 22. | Gong Tian | Gong Tian | Department of Agriculture and Rural Affairs of Sichuan Province /Local officer | | | |

### C.3.2. Type of Questions asked by the team members and answers reveived:

During the site visit, the verifier 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 MR.

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

1. The representatives from project owner were asked the following questions
    a. General aspects of the project
    b. Animal Manure treatment system operation situation
    c. Biogas production
    d. Main equipment and monitoring devices
    e. Project implementation
    f. Involved personnel and responsibilities
    g. Implementation of the monitoring system
    h. Monitoring devices
    i. Sampling method
    j. Monitoring data collection and data management
    k. QA/QC
    l. Emergency procedure

All the related information has been provided by project owner interviewees which is confirmed as consistent with the MR description and project implementation 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. 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 MR description and project implementation 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

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.

4. The local officers were asked the following questions:
    a. National and local legislation of the project type
    b. Local government's attitude to the project
    c. Environmental impacts of the project
    d. Environmental protection Measurements of the project
    e. 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 MR description and project implementation and also verified by checking the approval/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. Continuous input / grievance
    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 MR description. All of them know how to raise input / grievance to the project and they all confirmed that no negative comments to the project implementation. Refer the main contents in the report for detail assessment of the related information.

## D.4. Sampling approach

Refer to section E.5 and E.6.4 of this report for detail assessment of sampling approach.

## D.5. Clarification requests, corrective action requests and forward action requests raised

| Areas of verification findings | No. of CL | No. of CAR | No. of FAR |
|---|---|---|---|
| General Description of Project | - | CAR 01<br>CAR 02 | - |
| Remaining forward action requests from validation and/or previous verification | - | - | - |
| Compliance of the project implementation with the registered project design document | - | CAR 03 | - |
| Post-registration changes | - | - | - |
| Compliance of the monitoring system applied by the project with the registered monitoring plan | - | CAR 04 | - |
| **Compliance of monitoring activities with the registered monitoring plan** | - | | |
| SDG Data and parameters fixed ex ante or at renewal of crediting period | - | - | - |
| SDG Data and parameters monitored | - | - | - |
| Comparison of monitored parameters with last monitoring period | - | - | - |
| Compliance of the sampling implementation with the registered sampling plan | - | - | - |
| **Assessment of data and calculation of SDG Impacts** | - | | |
| Calculation of baseline value or estimation of baseline situation of each SDG Impact | - | - | - |
| Calculation of project value or estimation of project situation of each SDG Impact | - | - | - |
| Calculation of leakage | - | CAR 05 | - |
| Calculation of net benefits or direct calculation for each SDG Impact | - | - | - |
| Comparison of actual SDG Impacts with estimates in | - | - | - |

| | | | |
|---|---|---|---|
| approved PDD | | | |
| Remarks on increase in achieved SDG Impacts from estimated value in approved PDD | - | - | - |
| Safeguards reporting | - | - | - |
| Stakeholder inputs and legal disputes | - | CAR 06 | - |
| Others (please specify) | - | - | - |
| **Total** | **0** | **6** | **-** |

## SECTION E. Verification findings

### E.1. General Description of Project

| | |
|---|---|
| **Means of verification** | A draft monitoring report was submitted to the verification team by the project participants prior to the start of the verification activities.<br>It is checked that the appropriate form has been used for compiling the MR as per the Gold Standard for Global Goals Monitoring Report Template version 1.1 in October 2020/42/.<br>Further every section has been checked against the GS4GG Principles& Requirements/43/.<br>Via on-site investigation, CTI confirmed that the project installs new animal waste management systems by replace the current open anaerobic lagoons with 5 new closed anaerobic digesters to a group of 5 swine farms in Sichuan Province, which will treat the manure and wastewater from the 5 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. An Animal Manure Management System (AMMS) has been installed in each swine farm respectively which treat the manure and wastewater from the 5 swine farms. The raw materials such as pig manure, urine and washing water are collected, and by Upflow Anaerobic Sludge Bed Reactor (UASB), the biogas generated. The project is expected to produce about $3,989.0149*10^4$ $m^3$ biogas annually. The biogas produced is captured and then sent to the biogas generator for power generation, each generator is installed in each subsidiary swine farm, total installed capacity of the proposed project is 8.1MW and the annual electricity production is estimated to be 51,854 MWh, and used by the AWMSs and swine farms and surplus biogas will be destroyed through the flaring system (if any). The fermented sludge from the aerobic composting system is used to produce organic fertilizer which partly are supplied to the farmers living around for free and others are 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. Hence, it is confirmed that the project is implemented in line with the PDD.<br>The project built 5 new animal waste management systems in 5 existing swine farms, replacing the current open anaerobic lagoons with 5 new closed anaerobic digesters. An Animal Manure Management System (AMMS) has been constructed and installed in each swine farm respectively which treat the manure and wastewater from the 5 swine farms to avoid methane emissions generated in the baseline uncovered anaerobic lagoons which is confirmed by site inspection.<br>The raw materials such as manure and wastewater is collected into waste collecting tanks and then be separated first by Solid-liquid separator, and by a Upflow Anaerobic Sludge Bed Reactor (UASB) as its anaerobic digester technologies, then the biogas generated. It is estimated that 5 swine farms involve 359,870 heads of marketing swine, 54,100 heads of breeding swine which has been confirmed during the validation process. Live pigs are kept for 180 days in the farms before shipment and are estimated to produce 664,836 tons of manure every year.<br>The biogas produced is recovered and combusted for power generation and used by the AWMSs and swine farms. At the same time, and the residual biogas was flared if there is any surplus biogas. The fermented sludge from the aerobic composting system is used to produce organic fertilizer, part of the organic fertilizers are supplied to the farmers living around for free. And wastewater has been treated aerobically and then used for agriculture irrigation which has been confirmed by site inspection.<br>Via checking the MR, CTI confirmed that the technical description and technical flow chart are described clearly and actual by site inspection of all the swine farms and 5 new animal waste management systems.<br>All the closed anaerobic digesters, waste collecting tanks, solid-liquid separators, Upflow Anaerobic Sludge Bed Reactors (UASB), desulfurization and dehydration system, turnover machines, biogas generators, flares and related auxiliary facilities |

<table>
<tr><td></td><td>were all normally implemented which has been confirmed by site inspection and confirmed as in line with the description in the PDD/3/.<br>The project activity enables 5 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, thus avoid GHG emission of methane from anaerobic treatment of swine manure and wastewater through recovery and destruction of biogas.<br>The project applied CDM Methodology ACM0010 “GHG emission reductions from manure management systems” (Version 08.0)/32/.<br>The location of the project activity is in Sichuan Province, P.R. China.<br>The detailed geographic coordinates of the project included in this monitoring period is listed as below:
<table>
<tr><th>Item</th><th colspan="3">Project Location</th></tr>
<tr><td>Host Country</td><td colspan="3">China</td></tr>
<tr><td>Region:</td><td colspan="3">Sichuan Province</td></tr>
<tr><td colspan="4">Geographical Coordinates</td></tr>
<tr><td colspan="2">Swine farm</td><td>East longitude</td><td>North latitude</td></tr>
<tr><td colspan="2">Huayuan Swine Farm</td><td>104°56′38″</td><td>31°18′28″</td></tr>
<tr><td colspan="2">Lingxing Swine Farm</td><td>105°0′29″</td><td>31°10′4″</td></tr>
<tr><td colspan="2">Xingfu Swine Farm</td><td>102°35′47″</td><td>27°15′52″</td></tr>
<tr><td colspan="2">Tianchen Swine Farm</td><td>102°42′59″</td><td>27°05′10″</td></tr>
<tr><td colspan="2">Changyun Swine Farm</td><td>102°43′31″</td><td>27°04′24″</td></tr>
</table>
The project location has been clearly provided in section A.2 of the MR, which has been verified by site inspection with GPS device and the detailed coordinates of the 5 swine farms have been provided respectively which have also been verified by site inspection with GPS device and the information is correct.<br>The project start date is 28/07/2021 which has been confirmed by checking the equipment purchase contracts/9/, and was put into operation on 01/01/2022 which has been confirmed by checking the operation log of the project/12/ and record of operation started of each AWMS/24/.<br>The project was applied as a GS-VER project with the GS Reference number of GS11712. According to the PDD and validation report/3/,/4/, the project participant has adopted for the renewable crediting period of 15 years with the start date of 1st crediting period of 01/01/2022. The first monitoring period is from 01/01/2022 to 31/12/2022 (first and last days included) belongs to the first crediting period.<br>As part of the site visit the Verification Team was able to confirm that the project description in MR is in accordance with the project description contained in the PDD/3/.</td></tr>
<tr><td>Findings</td><td>CAR 01 and CAR 02 were raised and resolved.<br>Refer to Appendix 4 in this report for detail assessment.</td></tr>
<tr><td>Conclusion</td><td>It can be confirmed that the final version Monitoring report/1/ is complete and transparent and in accordance with the PDD/3/ and Global Goals Monitoring Report Template version 1.1 in October 2020/42/.<br>Refer to the below sections for details.</td></tr>
</table>

## E.2. Remaining forward action requests from validation and/or previous verification

This is the 1st verification of the project activity. Via checking the validation report/4/, CTI verified that there is no FAR was raised.

## E.3. Compliance of the project implementation with the registered project design document

| | |
|---|---|
| **Means of verification** | By means of an in-depth review of the PDD and the inspections carried out during the on-site visit, an assessment has been carried out whether the project has been implemented and operated in line with the PDD and whether all physical features of |

| | |
|---|---|
| | the project are in place. The following has been checked: implemented technology, project equipment as well as monitoring equipment.<br>The verifier has performed a site visit to check the swine farms, project equipment, monitoring equipment and interview with end users and staffs, in addition by all the provided evidence, it is found that the project started first construction (Lingxing Swine farm) on 21/08/2021 which has been confirmed by checking the construction contract/10/, and started first commissioning (Tianchen Swine Farm and Changyun swine farm) on 12/12/2021 and was put into operation on 01/01/2022 which has been confirmed by checking the operation log of the project/12/ and record of operation started of each AWMS/24/ and has been confirmed in the PDD and validation report/3/,/4/.<br>The factors and parameters used during this monitoring period to arrive at the emission reduction calculations are transparently described in the Monitoring Report/1/ and the emission reductions achieved during this monitoring period are 290,683 $tCO_2e$/2/.<br>This is the 1st monitoring period of 1st crediting period and the verification team herewith confirms that the project implementation is consistent since the validation as mentioned in the PDD. There are no major obstructions or gaps noted and no special event such as overhaul and downtimes of biogas digesters and power generators occurred during this monitoring period.<br>The actual implementation and operation of the project are found in accordance with the descriptions provided in the PDD. There is no deviation / change evidenced during this monitoring period and there were no delays compared to information in approved project. |
| **Findings** | CAR 03 was raised and resolved.<br>Refer to Appendix 4 in this report for detail assessment. |
| **Conclusion** | Assessment concludes the following:<br>- The implementation status of project activity was found to be in compliance with PDD/3/.<br>- CTI has conducted the on-site visit to confirm the implementation status of the project w.r.t. the realized technology.<br>- The actual operation of project activity was found to be in compliance with PDD/3/.<br>- There were no delays compared to information in approved project. |

## E.4. Post-registration changes

### E.4.1. Temporary deviations from Certified Key Project Information, Project Design Document, Monitoring & Reporting Plan, applied methodology or applied standardized baseline

Not Applicable

### E.4.2. Corrections

Not Applicable

### E.4.3. Changes to start date of crediting period

Not Applicable

### E.4.4. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

Not Applicable

### E.4.5. Changes to project design of approved project

Not Applicable

## E.5. Compliance of the monitoring system applied by the project with the registered monitoring plan

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| **Means of verification** | By means of comparison of the MR with the applied CDM methodology and all applicable GS4GG guidelines, the verification team has checked whether the monitoring system is in compliance with the monitoring plan in the PDD/3/ and related requirements of the applied methodology/32/ whether the sample plan conducted accordingly, the source and the applied value of the SDG monitored parameter is acceptable; whether the parameters monitored explain the operational and management structure, responsibilities and institutional arrangement for data collection/archiving, QA/QC procedures.<br>The monitoring system applied by the project compliance with the registered monitoring plan is demonstrated as below:<br>**Monitoring for SDG parameters**<br>For Mitigation Measure for Safeguarding Principles<br>Employee Training of biogas safety operation<br><br>SDG 8<br>Total number of jobs<br><br>SDG 7<br>Total electricity produced<br><br>SDG 13<br>a) Number of animals of type LT produced annually for the year y, $N_{p,LT}$<br>b) Number of days animal of type LT is alive in the farm in the year y, $N_{da,LT}$<br>c) Daily stock of animals in the farm, discounting dead and discarded animals, $N_{AA,LT}$<br>d) Average animal weight of a defined livestock population at the project site, $W_{site}$<br>e) Number of days treatment plant was operational in year y, $n_{dy}$<br>f) Quantity of electricity consumed by the proposed project in year y, $EC_{PJ,j,y}$<br>*g)* Average technical transmission and distribution losses for providing electricity to source *j* in year *y,* $TDL_{j,y}$<br>h) Biogas flow, $V_f$<br>i) Volumetric flow of the gaseous stream in time interval t on a dry basis, $V_{t,db}$<br>j) Volumetric fraction of greenhouse gas I in a time interval t on a dry basis, m³ gas i/m³ dry gas, $V_{i,t,db}$<br>k) Temperature of the gaseous stream in time interval t, $T_t$;<br>l) Pressure of the gaseous stream in time interval t, $P_t$;<br>m) Density of greenhouse gas i in the gaseous stream in time interval t, $\rho_{i,t}$;<br>n) Fraction of volatile solids directed to aerobic treatment $F_{Aer}$;<br>o) Fraction of manure handled in system j in project activity $MS\%_j$<br>p) Maximum methane producing potential of the volatile solid generated by animal type LT, $B_{0,LT}$<br>q) Type of barn and AWMS, *Type*<br>r) Annual average ambient temperature at project site, *T*<br>s) Annual average nitrogen excretion per head of a defined livestock population estimated as described in Appendix 2, $NEX_{LT,y}$<br><br>CTI confirmed that all the monitoring parameters listed in the PDD have been |

provided in the MR corresponding to each SDG impact.

Refer to below section E.6.2 for detail assessment of the monitoring parameters.

**Monitoring framework**

The MR contains a diagram illustrating the Organization Structure of the Monitoring Team implemented by the project owner to implement the project activity which is confirmed consistent with the PDD. The GS monitoring team are responsible for the monitoring of all the parameters monitored for this monitoring period. And all the data was reviewed by the project developer. The organizational structure is considered sufficient to fulfil the monitoring requirements of the methodology and ensure that emission reductions verified for this monitoring period.

**Monitoring equipment and installation:**

Measurement instruments are described in the MR as subject to appropriate national standards with respect to installation, accuracy and calibration interval. Main instruments weight measurers, flow meters, gas analyzers, and electricity meters are used to monitor the related SDG parameters, refer to E.6.2 of this report for detail assessment of the installed monitoring devices.

The flow chart of monitoring system has been provided in the MR and checked by verifier, and via site inspection of the monitoring equipment, CTI verified that all the measuring equipment have been installed as per the location in flow chart of monitoring system of MR and monitoring plan in the PDD, thus is considered sufficient to carry out the monitoring requirements as planned in the PDD and requested in the methodology, and the appropriate national standards have been followed.

**Sampling Method and Process**

Sampling plan is designed by PD in PDD 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)"/33/.

For this monitoring period, as per the sampling plan in the PDD, below methods have been taken by PP to carry out the sampling,

a. To determine the total population–- Calculate the overall sample size based on the actual population of pigs in stock firstly– *the Export record form of Market swine/15/ have been checked and the total population of pigs determined are verified as correct and actual;*
b. To determine the sample size for each farm–- The project involved 5 swine farms (all including market swine and breeding swine), then the sample size in each swine farm is adjusted based on the proportion of the number of each farm in the total number of 5 swine farms– *the calculation sheet of sample size/28/ is checked as correct and actual;*
c. To determine the sample size of each age group— The sample size of each age group of Market swine and Breeding swine in a farm is also calculated based on the proportion of the number of each age group of Market swine and Breeding swine to the total number of swine in two kinds of farms– *the calculation sheet of sample size/28/ is checked as correct and actual;*
d. To ensure representativeness, each defined livestock population has been classified into a minimum of three age categories including Nursery phase, Growing phase and Mature phase – *the monthly records of animal weight of a defined livestock population of three age categories/16/ have been checked and the three age categories determined are verified as in line with the PDD and applied methodology*
e. After the sample size in each age group of Market swine and Breeding swine of each swine farm determined, the sample is conducted in every swine farm.

| | |
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| | Since swine in different age are kept in the different pig houses, samples can be randomly selected from pig houses of this age group – *the samples choosing method is checked as correct and actual;*<br>f. For each defined livestock population, a minimum of one monthly sample per age category has been taken–- *the monthly records of animal weight of a defined livestock population of three age categories/16/ have been checked and one monthly sample per age category determined for each defined livestock population are verified as in line with the PDD and applied methodology*<br>g. If the same samples are taken the following month, then new samples will be taken, this will be done every month until the end of the monitoring period–- *the monthly records of animal weight of a defined livestock population of three age categories/16/ have been checked and confirmed that the samples are not same for each month.*<br><br>PP uses 95/10 confidence/precision as the criteria for the reliability of sampling efforts–- *verified as in line with the standard of "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)" and applied methodology*<br>Via site inspection and interview with chiefs of farms and PD, CTI confirmed that the monitoring activities of the $W_{site}$ have been conducted in the three age groups of Nursery phase, Growing phase and Mature phase in each swine farm at least one monthly which is verified as in line with the above requirements and the 95/10 confidence/precision is confirmed as used by PP as the criteria for the reliability of sampling efforts.<br>The method of calculation of sample size is checked by CTI by checking the calculation sheet of sample size/28/, 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)"/34/ and PP has used 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)"/33/ and is verified consistent with PDD.<br>The one monthly monitoring activity of the samples have been completed in the 5 swine farms during this monitoring period. The monitoring forms have been filled out by the Breeders in the 5 swine farms to record the animal weight of the samples/16/.<br>The implementation of sampling method and process including monitoring, data recording and collection, QA/QC procedure, emergency procedure is stated by PP which is confirmed as actual and reasonable by site inspection and interview with the chief of farms and monitoring team.<br>As per the MR, for monitoring the $W_{site}$, according to "Standard: Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)", the desired confidence level is 95% and the desired precision is 10%. According to statistical principles and sampling survey method, 441 samples is sufficient to satisfy the desired confidence and precision. Hence PD has taken 441 samples for measuring the weight and record all the weight in the record the animal weight of the samples, due to the record only have the values of 441 samples, VVB did not have to do the sampling check of the records from 441 samples, VVB checked all the data of 441 samples and no acceptance sampling method need to be done for all the 441 samples in the records.<br>The sampling method conducted by PD is verified as stated in the verification report: The method of calculation of sample size is checked by CTI by checking the calculation sheet of sample size, 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)" and PP has used 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)" and is verified consistent with PDD.

As per the above explanation, VVB could not weight the swine during site visit, due to the safety reason and considering the swine fever impacts, people outside the swine farms are not allowed to be inside the swine farms but can only do the AWMS plants inspection. Hence no such sample results conducted by VVB for the checking the weight of the swine during site visit. And furthermore, due to the swine which has been sampled by PD is during the monitoring period, and VVB can only do the verification after the monitoring period ended, so when the VVB does the on-site check, it is not possible for VVB to check the PP sampled swine as these swine has raised with more weight or be sold to the market with the time passed. So, actually, VVB can't do the acceptance sampling during the site visit time as the samples from PD will not have the same weight with the PD's measuring.

Therefore, to cross-check the weight data of the PD's samples, VVB has checked the public information of the weight of market swine[1,2] and breeding swine[3,4] in different categories including Nursery phase, Growing phase and Mature phase, it is confirmed that the average weight data for different categories are reasonable and thus the sampling results by PD are acceptable.

**Corrective actions:**

In case of non-conformities would be observed, the corrective action plan will be referred and the whole GS monitoring team will follow recognized standard data evaluation methods to guarantee that the data is reliable and accurate. Via site inspection of the log of the project operation/12/ and interview with the staffs, CTI confirmed that there was no correction of nonconformities occurred in implementation of the project or the monitoring plan during the 1st monitoring period.

**Quality Assurance and Quality Control**

The related QA/QC procedure has been conducted by PP for the monitoring process including data verification and cross check by monitoring team and project owner which has been verified by site interview with staffs and checking the training records/25/.

CTI confirmed that the QA/QC procedure has been implemented by PP properly during this monitoring period and the data management is confirmed as effective. Refer to below section E.6.2 for detail assessment of each

**Training:**

Trainings related to monitoring have been provided to relevant personnel of monitoring team yearly so that all the staffs are competent for the monitoring work which is verified by checking the training records/25/.

**Data management:**

The data management and archiving procedure has been provided in the MR which is confirmed as actual and reasonable by checking the PDD, during the on-site inspection, CTI confirmed that all the data has been recorded, collected, managed and archived accordingly for this monitoring period and 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.

[1] https://www.ziyunlou.com/article/2pdr12.html#:~:text=%E7%8C%AA%E7%9A%84%E7%94%9F%E9%95%BF%E5%8F%91%E8%82%B2%E9%98%B6%E6%AE%B5,%E4%B8%8A%E5%B8%82%EF%BC%89%E5%9B%9B%E4%B8%AA%E9%98%B6%E6%AE%B5%E3%80%82

[2] https://www.jiangxiqicheng.com/96258.html

[3] https://zhuanlan.zhihu.com/p/369296668

[4] https://baike.baidu.com/item/%E7%A7%8D%E7%8C%AA/7148836

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| | **Emergency Procedure**<br>Project proponents will take actions to deal with malfunction and/or damage if any damage to the operation of the system, and the most conservative approach are used for emission calculations during the emergency period.<br>Via checking the operation log/12/ and all the data collected for biogas flow and electricity, it is verified that there was no emergency happened during this monitoring period.<br><br>**Non-Double counting assessment**<br>The VVB has checked for double counting by reviewing all relevant registries including CDM/53/, VCS/54/, China CER/52/ and other GHGs programs such as EU ETS, IREC or subnational, various regional schemes and provincial/state-based schemes. Besides, due to all swine farms involved in this project has unique identified GPS coordinates, hence, it can't be counted in any other voluntary market or emission reduction mechanism. CTI confirmed that there is no potential exists for Double Counting of emissions reductions due to issuance of Gold Standard VERs/$CO_2$-certificates from the considered project activity for this monitoring period.<br>Furthermore, via on-site inspection, it is 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 1.2)/47/.<br>Besides, 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 $CO_2$e/year which has been verified in the public website/55/, and it is 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/56/.<br>Finally, via checking the Declaration of No Double Counting Statement/26/, it is confirmed that the emission reductions were not double counted for this monitoring period.<br>In conclusion, CTI verified that Project Developer has provided Gold Standard with satisfactory justification that no double counting of emission reductions occurred for this monitoring period.<br>In conclusion, the MP is completely in accordance with the approved methodology applied by the GS project and PDD. |
| **Findings** | CAR 04 was raised and resolved.<br>Refer to Appendix 4 in this report for detail assessment. |
| **Conclusion** | The monitoring plan complies with the applied methodology and the monitoring system and all applied procedures are completely in compliance to the latest approved monitoring plan and the methodology. |

## E.6. Compliance of monitoring activities with the registered monitoring plan

### E.6.1. SDG Data and parameters fixed ex ante or at renewal of crediting period

**Means of verification**

The values of ex-ante parameter assessed in the table given below:

**Ex Ante Data and Parameters**

| Parameters | Value | Reference | Assessment by VT |
|---|---|---|---|
| ***$GWP_{CH4}$*** **– SDG 13**<br>Global Warming Potential of $CH_4$ | 28 $tCO_2e/tCH_4$ after 2021 | IPCC Fifth Assessment Report (AR5) | Confirmed as per the GS requirement and IPCC Fifth Assessment Report/58/ and consistent with the PDD |
| ***$GWP_{N2O}$*** **– SDG 13** | 265 $tCO_2e/tCH_4$ | IPCC Fifth Assessment Report (AR5) | Confirmed as per the GS requirement and IPCC |

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| Global Warming Potential of $N_2O$ | after 2021 | | Fifth Assessment Report/58/ and consistent with the PDD |
| **$D_{CH4}$ – SDG 13** Density of $CH_4$ | 0.00067 $t/m^3$ | ACM0010 Version 08.0 | Confirmed as per the applied methodology/32/ and consistent with the PDD |
| **$MCF_j$ – SDG 13** Methane conversion factor for the baseline AWMSj | 70.50% | IPCC 2006 table 10.17, chapter 10, volume 4 | A conservativeness factor has been applied by multiplying $MCF_j$ value (i.e., 75%) with a value of 0.94, to account for the 20 per cent uncertainty in the $MCF_j$ values which is confirmed as reported by IPCC 2006/59/ and consistent with the PDD. For this monitoring period, the monthly average temperature from 01/01/2022 to 31/12/2022 is 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture. While the annual average ambient temperature applied in PDD from public website is 16-18℃, which is obtained based on years of history, so the actual temperature at project site in this monitoring period is higher than the value from public website. Therefore, the value of MCF is 75% with the lower temperature of 16℃ as per Appendix 3 of ACM0010 (Version 08.0). |
| **$MS\%_{BI,j}$ – 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 per PER/7/, baseline evidence/21/ and consistent with the PDD. |
| **$W_{default}$– SDG 13** Default average animal weight of a defined population | $W_{default}$ (Market swine) =28kg<br>$W_{default}$ (Breeding swine) =28kg | IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4 | Confirmed as reported by IPCC 2006/59/ and consistent with the PDD. |

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| | **$VS_{default}$– SDG 13**<br>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<br>$VS_{default}$ (Breeding swine) =0.3 kg-dm/animal/ day | IPCC 2006 table 10A-7 and 10A-8, chapter 10, volume 4 | Confirmed as reported by IPCC 2006/59/ and consistent with the PDD. |
| | **$N_{rate(T)}$ – SDG 13**<br>Default N excretion rate | $N_{rate(T)}$ (Market swine) =0.42 kg N (1000 kg animal mass)$^{-1}$ day$^{-1}$<br>$N_{rate(T)}$ (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 reported by IPCC 2006/59/ and consistent with the PDD. |
| | **$NEX_{IPCC\ default}$ – SDG 13**<br>Default value for the nitrogen excretion per head of a defined livestock population | Refer to MR for monthly data | Calculated by the equation:<br>$NEX_{IPCC\ default} = N_{rate(T)} * TAM/1000*365$ | Confirmed as according to the calculation equation.<br>Via checking the formular, it is confirmed that 365 represents 365 days per year, which corresponds to the unit of this parameter: kg N / animal / year and $N_{rate(T)}$ means the default N excretion rate with the unit of kg N/ (1000 kg animal mass)/ day. While this monitoring period is 01/01/2022-31/12/2022, covering one year. Therefore, this parameter is calculated according to the actual number of days. |
| | **TAM – SDG 13**<br>Typical animal mass for livestock category | TAM (Market swine) =28 kg animal$^{-1}$<br>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 reported by IPCC 2006/59/ and consistent with the PDD. |
| | **$F_{gas\ MS,j,LT}$– SDG 13** | $F_{gasMS,j,LT}$, (anaerobic | IPCC 2006 table 10.22, chapter 10, | Confirmed as reported by IPCC 2006/59/ and |

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| | Default values for nitrogen loss due to volatilisation of $NH_3$ and $NO_X$ from manure management | lagoon) : 40% $F_{gasMS,j,LT}$ , (solid storage) : 45% | volume 4 due to site specific data is unavailable | consistent with the PDD. |
| | **$EF_{N2O,D,j}$– 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 reported by IPCC 2006/59/ and consistent with the PDD. |
| | **$EF_{N2O,ID,j}$– SDG 13** Indirect $N_2O$ emission factor for the treatment system j of the manure management system | 0.01 kg$N_2O$-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 reported by IPCC 2006/59/ and consistent with the PDD. |
| | **$EF_{CH4,default}$– 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/39/. Via checking the Digester equipment purchase contract/9/, 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 and anaerobic digester: 20%, 80% for leakage $N_2O$ emission released during project activity $R_{VS,n}$, one cell lagoon: 85% for leakage | Appendix 1 of methodology ACM0010 | Confirmed as per the Appendix 1 of methodology ACM0010/32/ and consistent with the PDD. |

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| | $N_2O$ emission released during baseline scenario | | |
| **$R_{N,n}$– SDG 13** Nitrogen reduction factor | $R_{N,n}$, project activity(aerobic treatment and anaerobic digester): 5%, 25% $R_{N,n}$, baseline (uncovered anaerobic lagoon) : 80% | Appendix 1 of methodology ACM0010 | Confirmed as per the Appendix 1 of methodology ACM0010/32/ and consistent with the PDD. |
| **$EF_1$, $EF_4$, $EF_5$– SDG 13** Emission factor for $N_2O$ emissions from N inputs; from N leaching and runoff; from atmospheric deposition of N on soils and water surfaces | $EF_1$ = 0.010 kg $N_2O$-N/kg N $EF_4$ =0.010 kg $N_2O$-N/(kg $NH_3$-N and $NO_X$-N $EF_5$ = 0.0075 kg $N_2O$-N/kg N | IPCC 2006 Guidelines default values are be used, since country specific or region specific data are not available. $EF_1$ from table 11.1, chapter 11, volume 4. $EF_4$ and $EF_5$ from table 11.3, chapter 11, volume 4 due to site specific data is unavailable | Confirmed as reported by IPCC 2006/59/ and consistent with the PDD. |
| **$F_{gasm}$– 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 reported by IPCC 2006/59/ and consistent with the PDD. |
| **$F_{leach}$– 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 reported by IPCC 2006/59/ and consistent with the PDD. |
| **$MCF_d$ – SDG 13** Methane | 1 | Methodology ACM0010 (version 08.0) | Confirmed as per the applied methodology/32/ and consistent with the |

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| | conversion factor for leakage calculation | | | PDD |
| | **$EF_{EF,j,y}$ – SDG 13** Emission factor for electricity generation | 0.57205 $tCO_2$/MWh | China DNA | Confirmed as correct for ex ante determination as per the DNA data/60/ and consistent with the PDD |
| | **$R_u$ – 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 per the applied Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/38/ and consistent with the PDD |
| | **$MM_i$ – 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 per the applied Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)/38/ and consistent with the PDD |
| | **$\eta_{flare,m}$– SDG 13** Flare efficiency in minute m | 0% | Tool 06 "Project emissions from flaring (Version 03.0)" | Confirmed as correct open flare as per the applied Project emissions from flaring (Version 03.0)"/37/ |
| | The assessment team has checked that all the ex-ante parameters were fixed at the level of PA and were verified from the validated PDD/3/. Also, the ex-ante parameter values have been consistently applied for the ER calculation which is evident from the ER calculation sheet/2/. | | | |
| **Findings** | N/A | | | |
| **Conclusion** | The values mentioned in the Monitoring Report/1/ and Emission Reduction Spreadsheet/2/ are consistent with the PDD/3/. The applied values are correct and justified. | | | |

### E.6.2. SDG Data and parameters monitored

**Means of verification**

**1. $N_{p,LT}$**

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| **Relevant SDG indicator:** | SDG13 |
| **Data/Parameter** | **$N_{p,LT}$** |
| Unit | Number |
| Description | Number of animals of type LT produced annually for the year y |
| Value applied for this monitoring period | 612,963 heads of marketing swine |
| Measuring /Reading /Recording frequency | Monitored monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |

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| | methodology? (Yes / No) | |
| | Monitoring equipment with accuracy | N/A |
| | Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? | N/A |
| | How were the values in the monitoring report verified? | Values of Monitoring parameter of $N_{p,LT}$ were derived from Export record form of Market swine issued by PP/15/ for this monitoring period.<br>Data were recorded by technicians in farms each month and sourced from the data logged in each swine farm which has been confirmed by site inspection and checking the Export record form of Market swine issued by PP/15/.<br>Via site inspection, it is confirmed that 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 can be connected to the Data Collection System (DCS), which can store and read information. Through this method, 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 which has been verified as effective by site inspection of the electronic ear tag and Data Collection System (DCS).<br>Each farm control and record the numbers strictly due to the pigs production and sale are the commercial sources of farms. Hence, the recorded data are confirmed as reasonable and reliable. |
| | If applicable, has the reported data been cross-checked with other available data? | Yes. The Export record form of Market swine/15/ is cross-checked with the monthly Sale Records of Marketing swine/17/ of each farm. Via comparing with both sources, it is verified that values are consistent and hence the value of $\boldsymbol{N_{p,LT}}$ determined for this monitoring period is verified as correct and reasonable.<br>According to the Equation 4 in this MR, it is verified that the calculated $N_{LT}$ is 302,283 heads (612,963 heads *180days/365days).<br>While via checking the monthly Sale Records of Market swine/17/ of each farm, CTI confirmed that total 612,963 head of marketing swine is produced and sold into the market which is consistent with the value from Monthly production record of market swine.<br>According to the conservative principle, the 302,283 heads was applied in the calculations of emission reductions in MR, therefore, $N_{p,LT}$ is reasonable and credible. |
| | Does the data management ensure correct transfer of data and reporting of | Yes, QA/QC procedures were found to be appropriate and reliable.<br>Via checking the measuring method by reviewing the |

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| emission reductions and are necessary QA/QC processes in place? | Production record of Commercial Pig issued by PP/15/ and interview with technicians as stated in the MR, CTI verified that the method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>The Production record of Commercial Pig/15/ is cross-checked with the monthly Sale Records of Marketing swine/17/ of each farm. Via comparing with both sources, it is verified that values are consistent and hence the value of $N_{p,LT}$ determined for this monitoring period is verified as correct and reasonable.<br>And all the date will be archived electronically during project implementation plus 5 years. |

**2. $N_{da,LT}$**

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|---|---|
| **Relevant SDG indicator:** | SDG13 |
| **Data/Parameter** | $N_{da,LT}$ |
| Unit | days |
| Description | Number of days animal of type LT is alive in the farm in the year y |
| Value applied for this monitoring period | 180 |
| Measuring /Reading /Recording frequency | Monitored monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? | N/A |
| How were the values in the monitoring report verified? | Values of Monitoring parameter of $N_{da,LT}$ were derived from Export record form of Market swine issued by PP/15/ for this monitoring period.<br>Data were recorded by technicians in farms each month and sourced from the data logged in each swine farm which has been confirmed by site inspection and checking the Export record form of Market swine issued by PP/15/.<br>Via site inspection, it is confirmed that each pig involved in this project has a unique electronic ear tag when was born, which is an electronic device dedicated to the |

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| | identification and electronic management of animals, can track automatically. This electronic ear tag can be connected to the Data Collection System (DCS), which can store and read information. Through this method, the days of swine alive can be traced by the technical staffs using DCS in each farm, so it is confirmed that the recorded dates are reasonable and reliable. |
| If applicable, has the reported data been cross-checked with other available data? | Yes. The Export record form of Market swine/15/ is cross-checked with the sale records of Marketing swine/17/. Via comparing with both sources, it is verified that the days of swine alive in the farm is 180 days then for sale.<br>Furthermore, the alive days of 180 is verified as consistent with the number of days for pigs to be slaughtered by existing large-scale breeding groups in China/61/.<br>Hence it is verified that the days in MR is correct and actual. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>Via checking the measuring method by reviewing the Production record of Commercial Pig issued by PP/15/ and interview with technicians as stated in the MR, CTI verified that the method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>The Production record of Commercial Pig/15/ is cross-checked with the sale records of Marketing swine/17/. Via comparing with both sources, it is verified that the days of swine alive in the farm is 180 days then for sale.<br>And all the date will be archived electronically during project implementation plus 5 years. |

**3. $N_{AA,LT}$**

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|---|---|
| **Relevant SDG indicator:** | SDG13 |
| **Data/Parameter** | $N_{AA,LT}$ |
| Unit | Number |
| Description | Daily stock of animals in the farm, discounting dead and discarded animals |
| Value applied for this monitoring period | 45,963 heads of breeding swine |
| Measuring /Reading /Recording frequency | Monitored daily |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |

| | | |
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| | No) | |
| | Monitoring equipment with accuracy | N/A |
| | Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? | N/A |
| | How were the values in the monitoring report verified? | Values of Monitoring parameter of $N_{AA,LT}$ were derived from Breeding Swine stock record issued by PP/18/ for this monitoring period.<br>Number of Breeding Swine were recorded by technicians in farms each day and sourced from the data logged in each swine farm which has been confirmed by site inspection and checking the Breeding Swine stock record issued by PP/18/ of each farm.<br>Via site inspection, it is confirmed that 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 can be connected to the Data Collection System (DCS), which can store and read information. Through this method, the daily stock number of Breeding Swine from the first day of monitoring period can be recorded, and this record data including the new imported Breeding Swine and discounting dead and discharge Breeding Swine which can be traced and recorded by the technical staffs using DCS in each farm, so it is confirmed that the recorded dates are reasonable and reliable. Breeding swine stocks are derived from the DCS system and can be cross-checked by an artificial inventory containing the number of dead and discarded.<br>The annual average number of animals ($N_{AA,LT}$) was calculated as an average of the daily stock of breeding swine in the farms without considering dead animals and discarded animals. |
| | If applicable, has the reported data been cross-checked with other available data? | The values of animals dead/discarded which is derived from the DCS system have been cross-checked with the artificial inventory containing the number of dead and discarded, and the values are verified as consistent for each month. Thus the value used in MR is verified as correct. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>Via checking the measuring method by reviewing the Breeding Swine stock record with animals dead/discarded which is derived from the DCS system cross-checked by an artificial inventory containing the number of dead and discarded/18/ and interview with technicians as stated in the MR, also CTI checked the DCS system to confirm how the data was recorded, then CTI verified that the method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing |

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| | the data in MR with the evidence, CTI verified that the data in MR is correct.<br>The values of animals dead/discarded which is derived from the DCS system have been cross-checked with the artificial inventory containing the number of dead and discarded, and the values are verified as consistent for each month. Thus the value used in MR is verified as correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

**4. $W_{site}$**

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|---|---|
| **Relevant SDG indicator:** | SDG13 |
| **Data/Parameter** | $W_{site}$ |
| Unit | kg |
| Description | Average animal weight of a defined livestock population at the project site |
| Value applied for this monitoring period | Refer to values provided in MR |
| Measuring /Reading /Recording frequency | Monitored monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | For each Weight measurer,<br>Accuracy: III level<br>Type: DCS-QC-H<br>The calibration information and validity is listed as below table |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? | The above calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/. |

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | SW-27240022 | 17/12/2021, 13/12/2022 | 16/12/2022, 12/12/2023 |
| Lingxing swine farm | SW-27240023 | | |
| Xingfu swine farm | SW-27240024 | | |
| Tianchen swine farm | SW-27240025 | | |
| Changyun swine farm | SW-27240026 | | |

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| How were the values in the monitoring report verified? | Values of Monitoring parameter of $W_{site}$ were derived from Weight records issued by PP/16/ for this monitoring period.<br>For monitoring this parameter, a sampling method has been used by PP following the applied methodology and PDD.<br>Refer to section E.5 for detail assessment of the sampling method.<br>Via checking the sampling method by reviewing the Weight records issued by PP/16/ and interview with technicians as stated in the MR, CTI verified that the sampling and recording method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct. |
| If applicable, has the reported data been cross-checked with other available data? | To cross-check the weight data of the PD's samples, VVB has checked the public information of the weight of market swine[5,6] and breeding swine[7,8] in different categories including Nursery phase, Growing phase and Mature phase, it is confirmed that the average weight data for different categories are reasonable and thus the sampling results by PD are acceptable. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>Via checking the sampling method by reviewing the Weight records issued by PP/16/ and interview with technicians as stated in the MR, CTI verified that the sampling and recording method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>To cross-check the weight data of the PD's samples, VVB has checked the public information of the weight of market swine and breeding swine in different categories including Nursery phase, Growing phase and Mature phase as above assessment, it is confirmed that the average weight data for different categories are reasonable and thus the sampling results by PD are acceptable.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***5. $n_{dy}$***

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|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $n_{dy}$ |

[5] https://www.ziyunlou.com/article/2pdr12.html#:~:text=%E7%8C%AA%E7%9A%84%E7%94%9F%E9%95%BF%E5%8F%91%E8%82%B2%E9%98%B6%E6%AE%B5,%E4%B8%8A%E5%B8%82%EF%BC%89%E5%9B%9B%E4%B8%AA%E9%98%B6%E6%AE%B5%E3%80%82

[6] https://www.jiangxiqicheng.com/96258.html

[7] https://zhuanlan.zhihu.com/p/369296668

[8] https://baike.baidu.com/item/%E7%A7%8D%E7%8C%AA/7148836

| | |
|---|---|
| Unit | number |
| Description | Number of days treatment plant was operational in year y |
| Value applied for this monitoring period | 365 days |
| Measuring /Reading /Recording frequency | Measured Daily |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | Monitoring parameter of $n_{dy}$ was derived from Daily operation record of each treatment plant/19/.<br>PP record the actual number of days of each treatment plant that was operational daily. Finally, the Daily operation record of each treatment plant during this monitoring period were summarized by all the daily record. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. Daily operation record of each treatment plant/19/ is cross-checked with the rated flow of the biogas which has been provided in the MR and assessed as below, CTI verified that each treatment plant was operational in 365 days during this monitoring period. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>Via checking the Daily operation record of each treatment plant/19/ and interview with monitoring staff and PP, CTI verified that the method is in line with the PDD monitoring plan/3/ and applied methodology/32/.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>Daily operation record of each treatment plant/19/ is cross-checked with the rated flow of the biogas which has been provided in the MR and assessed as below, CTI verified that each treatment plant was operational in 365 days during this monitoring period.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***6. $EC_{PJ,j,y}$***

<table>
<tr><td>Relevant SDG:</td><td>SDG13</td></tr>
<tr><td>Data/Parameter</td><td>EC<sub>PJ,j,y</sub></td></tr>
<tr><td>Unit</td><td>MWh</td></tr>
<tr><td>Description</td><td>Quantity of electricity consumed by the project in year y</td></tr>
<tr><td>Value applied for this monitoring period</td><td>1,521.03</td></tr>
<tr><td>Measuring /Reading /Recording frequency</td><td>Continuous measurement and daily recording</td></tr>
<tr><td>Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No)</td><td>Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/.</td></tr>
<tr><td>Monitoring equipment with accuracy</td><td>5 Electricity meters 2 installed at each treatment plant<br>Accuracy: 0.5s<br>Type: DT862-4</td></tr>
<tr><td>Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No)</td><td>For each electricity meter, the calibration information and validity is listed as below table
<table>
<tr><th>Farm</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr>
<tr><td>Huanyuan swine farm</td><td>222580131</td><td rowspan="5">15/12/2021</td><td rowspan="5">14/12/2026</td></tr>
<tr><td>Lingxing swine farm</td><td>222580133</td></tr>
<tr><td>Xingfu swine farm</td><td>222580135</td></tr>
<tr><td>Tianchen swine farm</td><td>222580137</td></tr>
<tr><td>Changyun swine farm</td><td>222580139</td></tr>
</table></td></tr>
<tr><td>How were the values in the monitoring report verified?</td><td>Monitoring parameter of EC<sub>PJ,j,y</sub> was derived from Electricity daily report/30/ and cross-checked with electricity notes issued by grid company/29/.<br>The electricity consumptions were measured by the electricity meter installed at each treatment plant (total 5 Electricity meters).<br>Monitoring staff read the readings of electricity daily at 24:00 and recorded meter reading data into Electricity daily report/30/ which includes the electricity consumption of the treatment plant daily, and then the electricity consumption is calculated for each month.<br>Via checking the measuring method by reviewing the Daily operation record/19/ and electricity notes issued by grid company/29/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD monitoring plan/3/ and applied tool/36/.</td></tr>
<tr><td>If applicable, has the reported data been cross-checked with other available data?</td><td>Via site inspection and checking Electricity daily report/30/ and electricity notes issued by grid company/29/, it is confirmed that during this monitoring period, the values from both sources are consistent.</td></tr>
</table>

| | |
|---|---|
| (Yes / No) | |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The above calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the electricity meters are calibrated based on JJG 596-2012 Electrical Meters for Measuring Alternating-current Electrical Energy/48/. And based on this regulation, if the electricity meters can be used normally, recalibration is not required. The validity is five years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via site inspection and checking Electricity daily report/30/ and electricity notes issued by grid company/29/, it is confirmed that during this monitoring period, the values from both sources are consistent.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***7. $TDL_{j,y}$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $TDL_{j,y}$ |
| Unit | % |
| Description | Average technical transmission and distribution losses for providing electricity to source *j* in year *y*. |
| Value applied for this monitoring period | 20 |
| Measuring /Reading /Recording frequency | Changed once the tool is updated. |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring | N/A |

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| period? (Yes / No) | |
| How were the values in the monitoring report verified? | As per the tool of Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/36/, CTI confirmed that different values applied to different scenarios.<br>For the project, the electricity consumption was derived from the power grid. Hence, scenario A: Electricity consumption from the grid is applied to this situation. For this situation, a default value of 20% is used for $TDL_{j,y}$ in line with the tool/36/ and it is confirmed that this value is the maximum value as per Methodology tool 05 Version 03.0 and conservative.<br>Via checking the Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/36/, CTI confirmed that the data in MR is correct. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A, as the value is derived from tool. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |

***8. $F_{Aer}$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $F_{Aer}$ |
| Unit | Fraction |
| Description | Fraction of volatile solids directed to aerobic treatment |
| Value applied for this monitoring period | 100% |
| Measuring /Reading /Recording frequency | Annually |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this | N/A |

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|---|---|
| entire monitoring period? (Yes / No) | |
| How were the values in the monitoring report verified? | As no monitoring equipment was installed in the project activity to monitor the influent into anaerobic digestion and aerobic system, hence using 100% as conservative. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |

***9. $MS\%_j$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | ***$MS\%_j$*** |
| Unit | Fraction |
| Description | Fraction of manure handled in system j in project activity |
| Value applied for this monitoring period | 100% |
| Measuring /Reading /Recording frequency | Annually |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | As no monitoring was conducted in the project activity to monitor the fraction of manure handled, hence using 100% as conservative.<br>Furthermore, via site visit and interviewing with the staff from local environment agency, it is confirmed that all the manure flew into AWMSs to be treated; in addition, the manure is prohibited to be discharged outside as per the Regulations on Prevention and Control of |

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| | Pollution from Livestock and Poultry Farming/62/. Therefore, the value of this parameter using 100% is reasonable. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |

***10. $v_f$***

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|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $v_f$ |
| Unit | $m^3$ |
| Description | Biogas flow |
| Value applied for this monitoring period | Refer to values provided in the MR |
| Measuring /Reading /Recording frequency | Continuously by flow meters and reported cumulatively on weekly basis |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | 3 flow meters 1,2,3 installed at each treatment plant<br>Total 15 flow meters<br>Type: LUGB<br>Accuracy: 1.5 |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | For each flow meter, the calibration information and validity is listed as below table<br>Flow meter 1 |

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | 22490801044 | 10/12/2021 | 09/12/2023 |
| Lingxing swine farm | 22490801047 | | |
| Xingfu swine farm | 22490801050 | | |
| Tianchen swine farm | 22490801053 | | |

| | | |
|---|---|---|
| Changyun swine farm | 22490801056 | | |

Flow meter 2

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | 22490801045 | 10/12/2021 | 09/12/2023 |
| Lingxing swine farm | 22490801048 | | |
| Xingfu swine farm | 22490801051 | | |
| Tianchen swine farm | 22490801054 | | |
| Changyun swine farm | 22490801057 | | |

Flow meter 3

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | 22490801046 | 10/12/2021 | 09/12/2023 |
| Lingxing swine farm | 22490801049 | | |
| Xingfu swine farm | 22490801052 | | |
| Tianchen swine farm | 22490801055 | | |
| Changyun swine farm | 22490801058 | | |

How were the values in the monitoring report verified?

Monitoring parameter of $v_f$ was derived from Daily operation record/19/.

Via checking the applied methodology and PDD, it is confirmed that if the project participants can demonstrate that leakage in distribution pipeline is zero, it need be measured at any three points. For this project, all the biogas produced is used for heat generation and no leakage in distribution pipeline occurred which has been reflected in the actual monitoring process due to the biogas flow at outlet of the anaerobic digestion approximately equals to that at the inlet of boiler and the biogas flow is always 0 in inlet of flare system.

Therefore, the biogas flow measured at the three points is confirmed in line with the applied methodology.

The biogas flow data were measured by the flow meters installed at each treatment plant (total 15 flow meters 1,2,3), flow meters 1 are installed at outlet of the anaerobic digestion, flow meters 2 are installed at the inlet of biogas generator and flow meters 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection.

The flowmeters monitored data continuously, record hourly and saved automatically in the Data Collection System (DCS).

The data can be obtained from Data Collection System (DCS) and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record, then summarized as the monthly biogas production, biogas flow to the power generator and biogas flow to flare system is the sum of the daily output.

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| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Via comparing with the data of $v_f$ at outlet of the anaerobic digestion and at the inlet of biogas generator, it is confirmed that the values are similar by considering the gas loss, thus it is confirmed that no surplus biogas for the flaring system is correct and actual due to all the biogas produced has been used for power generation. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The above calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flowmeter/49/. And based on this regulation, the validity is two years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD and applied methodology.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***11. $V_{t,db}$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $V_{t,db}$ |
| Unit | $m^3$ dry gas/h |
| Description | Volumetric flow of the gaseous stream in time interval t on a dry basis |
| Value applied for this monitoring period | Refer to values provided in the MR |
| Measuring /Reading /Recording frequency | Continuously measurement |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | 3 flow meters 1,2,3 installed at each treatment plant<br>Total 15 flow meters<br>Accuracy:1.5 |

| | | |
|---|---|---|
| | | Type: HD-LUB |
| | Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | Refer to information for 15 flow meters above |
| | How were the values in the monitoring report verified? | Monitoring parameter of $V_{t,db}$ was derived from Daily operation record/19/.<br>The volumetric flow of the gaseous stream data was measured by the flow meters installed at each treatment plant (total 15 flow meters 1,2,3), flow meters 1 are installed at outlet of the anaerobic digestion, flow meters 2 are installed at the inlet of biogas generator and flow meters 3 are installed at the inlet of flare system which have been verified as correct and actual by site inspection.<br>The flowmeters monitored data continuously, record hourly and saved automatically in the Data Collection System (DCS).<br>CTI confirmed that the measurement method is actual and the gaseous stream is defined as dry according to the Tool 8: "Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 03.0)"/38/. Hence the monitoring parameter $V_{t,db}$ does not need to be calculated based on the wet basis flow plus water concentration.<br>The data can be obtained from Data Collection System (DCS) and the monthly data was exported by the staff at the beginning of next month and then recorded in daily operation record. Daily biogas flow is equal to the cumulative value of 24 hours, and monthly biogas flow can be accumulated on daily basis. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flowmeter/49/. And based on this regulation, the validity is two years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD and applied methodology. |

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| | Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***12. $V_{i,t,db}$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $V_{i,t,db}$ |
| Unit | m³ gas i/m³ dry gas |
| Description | Volumetric fraction of greenhouse gas i in a time interval t on a dry basis |
| Value applied for this monitoring period | Refer to values provided in the MR |
| Measuring /Reading /Recording frequency | Continuous measurement |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | Gas analyzers installed at each treatment plant<br>Total 5 gas analyzers<br>Type: BIOGAS-5000<br>Accuracy: ±1% |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | For each gas analyzer, the calibration information and validity is listed as below table |

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | TQBMSA-6990047 | 11/12/2021, 09/12/2022 | 10/12/2022, 08/12/2023 |
| Lingxing swine farm | TQBMSA-6990048 | | |
| Xingfu swine farm | TQBMSA-6990049 | | |
| Tianchen swine farm | TQBMSA-6990050 | | |
| Changyun swine farm | TQBMSA-6990051 | | |

| | |
|---|---|
| How were the values in the monitoring report verified? | Monitoring parameter of $V_{i,t,db}$ was derived from Daily operation record/19/.<br>The data are measured continuously and record hourly by online gas analysers installed at the outlet of the anaerobic digesters and saved automatically in the DCS. The data can be obtained from DCS and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly $CH_4$ concentration was calculated based on the 24-hour average and daily |

| | |
|---|---|
| | average $CH_4$ concentration and recorded finally in the Daily operation record/19/. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The above calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the gas analyzers are calibrated based on JJG693-2011 (Verification Regulation of Alarmer Detectors of Combustible Gas)/50/. And based on this regulation, the validity is one year.<br>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). And the zero verification with an inert gas ($N_2$) and one reading verification with a standard gas (single calibration gas) are implemented in the process of calibration, which is confirmed as in accordance with JJG693-2011.<br>All calibration gases are confirmed as from Nanjing Changyuan Industrial Gas Co., Ltd, which is a qualified reference materials manufacturer issued by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China on 06/09/2017/14/.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD and applied methodology.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***13. $T_t$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $T_t$ |
| Unit | K |
| Description | Temperature of the gaseous stream in time interval t |
| Value applied for this monitoring period | Refer to values provided in the MR |

| | | |
|---|---|---|
| | Measuring /Reading /Recording frequency | Continuously measurement |
| | Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| | Monitoring equipment with accuracy | 3 flow meters 1,2,3 installed at each treatment plant<br>Total 15 flow meters |
| | Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | Refer to information for 15 flow meters above |
| | How were the values in the monitoring report verified? | Monitoring parameter of $T_t$ was derived from Daily operation record/19/.<br>The temperature of the gaseous stream data was measured by the flow meters installed at each treatment plant (total 15 flow meters 1,2,3), flow meters 1 are installed at outlet of the anaerobic digestion, flow meters 2 are installed at the inlet of biogas generator and flow meters 3 are installed at the inlet of flare system, and record hourly and saved automatically in the DCS system. which have been verified as correct and actual by site inspection.<br>Via site inspection and checking the manufacture specification of the flow meter/20/, it is confirmed that the flow meter has the function to measure the temperature with recordable electronic signal (digital).<br>The data are monitored continuously, record hourly and saved automatically in the DCS. The data for this monitoring period have been obtained from DCS and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly temperature was calculated based on the 24-hour average and daily average temperature.<br>The readout of flowmeter was indicated degrees Celsius(°C). Therefore, the temperature $T_t$(K) is calculated as the equation T(K)=t(°C)+273.15 |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/. |

| | |
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| QA/QC processes in place? | Via checking the calibration reports/13/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flowmeter/49/. And based on this regulation, the validity is two years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD and applied methodology.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***14. $P_t$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $P_t$ |
| Unit | Pa |
| Description | Pressure of the gaseous stream in time interval t |
| Value applied for this monitoring period | Refer to values provided in the MR |
| Measuring /Reading /Recording frequency | Continuously measurement |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | 3 flow meters 1,2,3 installed at each treatment plant<br>Total 15 flow meters |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | Refer to information for 15 flow meters above |
| How were the values in the monitoring report verified? | Monitoring parameter of $P_t$ was derived from Daily operation record/19/.<br>The pressure of the gaseous stream data was measured by the flow meters installed at each treatment plant (total 15 flow meters 1,2,3), flow meters 1 are installed at outlet of the anaerobic digestion, flow meters 2 are |

| | |
|---|---|
| | installed at the inlet of biogas generator and flow meters 3 are installed at the inlet of flare system, and record hourly and saved automatically in the DCS system which have been verified as correct and actual by site inspection.<br>Via site inspection and checking the manufacture specification of the flow meter/20/, it is confirmed that the flow meter has the function to measure the pressure with recordable electronic signal (digital).<br>The data are monitored continuously, record hourly and saved automatically in the DCS. The data for this monitoring period have been obtained from DCS and the monthly data was exported by the staff at the beginning of next month. Daily and Monthly pressure was calculated based on the 24-hour average and daily average pressure. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the flow meters are calibrated based on JJG1029-2007-Verification Regulation of Vortex-shedding Flowmeter/49/. And based on this regulation, the validity is two years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD and applied methodology.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct.<br>And all the date will be archived electronically during project implementation plus 5 years. |

***15.*** $\rho_{i,t}$

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $\rho_{i,t}$ |
| Unit | kg gas i/m³ gas i |
| Description | Density of greenhouse gas i in the gaseous stream in time interval t |
| Value applied for this monitoring | Refer to values provided in the MR |

| | |
|---|---|
| period | |
| Measuring /Reading /Recording frequency | N/A |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, calculated in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | Calculated based on temperature of the gaseous stream in time interval t and pressure of the gaseous stream in time interval t. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |

**16.** $B_{0,LT}$

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | $B_{0,LT}$ |
| Unit | $m^3CH_4/kg$ -dm |
| Description | Maximum methane producing potential of the volatile solid generated by animal type *LT* |
| Value applied for this monitoring period | $B_{0,LT}$ (Market swine) =0.29<br>$B_{0,LT}$ (Breeding swine) =0.29 |
| Measuring /Reading /Recording frequency | Annually |
| Is measuring and reporting frequency in accordance with the | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |

| | |
|---|---|
| monitoring plan and monitoring methodology? (Yes / No) | |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | As no monitoring was conducted in the project activity to monitor the value, so, 0.29 $m^3CH_4$/kg -dm is still applied. The actual methane producing potential of the volatile solid generated by swine manure is 479.4ml/g VS according to the public literature which is higher than PDD value, therefore 0.29 $m^3CH_4$/kg -dm applied in monitoring period is conservative. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes.<br>The value is taken from published sources. The parameter value should be updated on latest available public data source. |

**17.** ***$NEX_{LT,y}$***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | ***$NEX_{LT,y}$*** |
| Unit | kg N/animal/year |
| Description | Annual average nitrogen excretion per head of a defined livestock population estimated as described in Appendix 2 |
| Value applied for this monitoring period | Refer to values provided in the MR |
| Measuring /Reading /Recording frequency | Annually |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed | N/A |

| | |
|---|---|
| monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | |
| How were the values in the monitoring report verified? | The value is calculated as the equation of option 2 in Appendix 2 as listed below and<br>$NEX_{LT,y} = \frac{W_{site}}{W_{default}} * NEX_{IPCC\ default}$<br>While, $NEX_{IPCC\ default}$ calculated as equation 30 of the IPCC 2006, volume 4, chapter 10/59/<br>$NEX_{IPCC\ default} = N_{rate(T)} * TAM/1000*365$<br>The value of $N_{rate(T)}$ and TAM applied in the equation is taken from published sources (2006 IPCC)/59/. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes. This parameter will be monitored annually by checking if the data updated on latest available public data source. The parameter value should be updated upon the changes occur in the monitoring period. |

**18.** ***Type***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | ***Type*** |
| Unit | / |
| Description | Type of barn and AWMS |
| Value applied for this monitoring period | N/A |
| Measuring /Reading /Recording frequency | N/A |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring | The swine barn and AWMS layout and configuration are collected to confirm whether the implementation of |

| | |
|---|---|
| report verified? | project as design. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes. Due to the project has been approved by government, it will not be changed during the implementation periods, hence the Type of barn and AWMS will not be changed, hence type will not be monitored due to all the other parameters monitored can determine if the project type has been changed or not. |

**19.** ***T***

| | |
|---|---|
| **Relevant SDG:** | SDG13 |
| **Data/Parameter** | ***T*** |
| Unit | °C |
| Description | Annual average ambient temperature at project site |
| Value applied for this monitoring period | 17.9℃ for Mianyang City<br>17.6℃ for Liangshan Yi Autonomous Prefecture |
| Measuring /Reading /Recording frequency | Monthly |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | The value is derived from Nanyang Meteorological Bureau /57/. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary | Yes. This parameter is monitored monthly by checking the annual average ambient temperature at project site derived from Nanyang Meteorological Bureau.<br>Annual average ambient temperature in this monitoring period is 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture, which is higher |

| | |
|---|---|
| QA/QC processes in place? | than the lowest ex-ante estimated value in PDD (16°C), So, during this monitoring period, the annual average ambient temperature at project site applied the lower ex-ante estimated value i.e. 16°C, which is more conservative.<br>MCF value is 75% with the lower temperature of 16°C as per Appendix 3 of ACM0010 (Version 08.0). Then multiplying MCF values with a value of 0.94, so 70.50% of MCFj is used for calculation during in this monitoring period. |

**20. Total number of jobs**

| **Relevant SDG:** | SDG8 |
|---|---|
| **Data/Parameter** | **Total number of jobs** |
| Unit | Number |
| Description | Full-time Jobs created for both men and women |
| Value applied for this monitoring period | 10 full-time jobs created including 5 males and 5 females |
| Measuring /Reading /Recording frequency | Once for each monitoring period |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the PDD/3/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from Record keeping books/22/ and labor contracts/23/ |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | N/A |
| How were the values in the monitoring report verified? | Monitoring parameter of Total number of jobs was determined by checking the record keeping books/22/ and labor contracts/23/, CTI verified that the number of jobs created during this monitoring period is 10 full-time jobs including 5 female and 5 male employees.<br>CTI verified that the data in MR is correct. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The record keeping books/22/ is cross checked with labor contracts/23/, training records of employees/25/ and on-site interview with staffs. |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The record keeping books/22/ is cross checked with labor contracts/23/, training records of employees/25/ and the value of full-time Jobs created for both men and |

| | |
|---|---|
| QA/QC processes in place? | women can be defined correctly. |

***21. $EG_{d,y}$***

| | |
|---|---|
| **Relevant SDG:** | SDG7 |
| **Data/Parameter** | **Total electricity produced** |
| Unit | $m^3$ |
| Description | Total electricity produced |
| Value applied for this monitoring period | 40,200 |
| Measuring /Reading /Recording frequency | Continuous measurement and daily recording |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the registered PDD/3/ and applied methodology/32/. |
| Monitoring equipment with accuracy | 5 Electricity meters 1 installed at outlet of biogas generator<br>Accuracy: 0.5s<br>Type: DT862-4 |
| Is the installed monitoring equipment has been duly calibrated for this entire monitoring period? (Yes / No) | For each electricity meter, the calibration information and validity is listed as below table |

| Farm | Serial No. | Calibrated Date | Validity |
|---|---|---|---|
| Huanyuan swine farm | 222580130 | 09/08/2021 | 08/08/2026 |
| Lingxing swine farm | 222580132 | | |
| Xingfu swine farm | 222580134 | | |
| Tianchen swine farm | 222580136 | | |
| Changyun swine farm | 222580138 | | |

| | |
|---|---|
| How were the values in the monitoring report verified? | Monitoring parameter of $EG_{d,y}$ was derived from Electricity daily report /30/.<br>The electricity consumptions were measured by the electricity meter installed at outlet of biogas generator (total 5 Electricity meters).<br>Monitoring staff read the readings of electricity daily at 24:00 and recorded meter reading data into Electricity daily report /30/ which includes the electricity generated from the biogas generator daily, and then the electricity generation is calculated for each month. |
| If applicable, has the reported data been cross-checked with | N/A |

| | |
|---|---|
| other available data? (Yes / No) | |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | Yes, QA/QC procedures were found to be appropriate and reliable.<br>The above calibration information has been confirmed by checking the calibration reports/13/ which has been conducted by qualified parties/14/.<br>Via checking the calibration reports/13/, CTI confirmed that all the electricity meters are calibrated based on JJG 596-2012 Electrical Meters for Measuring Alternating-current Electrical Energy/48/. And based on this regulation, if the electricity meters can be used normally, recalibration is not required. The validity is five years.<br>And based on the validity as above table, CTI confirmed that the installed monitoring equipment has been duly calibrated for this entire monitoring period.<br>Via checking the measuring method by reviewing the Daily operation record/19/ as stated in the MR and interview with monitoring staff, CTI verified that the method is in line with the PDD monitoring plan/3/ and applied tool/36/.<br>Via site inspection and checking Electricity daily report /30/, it is confirmed that during this monitoring period, the values from both sources are consistent.<br>Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in MR with the evidence, CTI verified that the data in MR is correct. |

**22. Employee Training of biogas safety operation**

| **Relevant SDG:** | **Mitigation Measure for Safeguarding Principles** |
|---|---|
| **Data/Parameter** | Employee Training of biogas safety operation |
| Unit | / |
| Description | Employees was trained on the safety operation of the biogas |
| Value applied for this monitoring period | Trainings of safety operation of the biogas carried out on 26/11/2021 and 15/11/2022 |
| Measuring /Reading /Recording frequency | Once a year |
| Is measuring and reporting frequency in accordance with the monitoring plan and monitoring methodology? (Yes / No) | Yes, the measuring and reporting frequency are in line with the PDD/3/. |
| Monitoring equipment with accuracy | N/A |
| Is the installed monitoring equipment has been duly calibrated for this | N/A |

| | | |
|---|---|---|
| | entire monitoring period? (Yes / No) | |
| | How were the values in the monitoring report verified? | Trainings of safety operation of the biogas carried out on 26/11/2021 and 15/11/2022 is confirmed by checking the training record/25/.<br>And via checking all the operation records of the treatment plants and by site inspection, it is verified that there was no safety accident occurred during this monitoring period.<br>CTI verified that the data in MR is correct. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |
| **Findings** | N/A | |
| **Conclusion** | The parameters have been monitored appropriately, in accordance with the validated monitoring plan/3/ (as per measurement methods and procedures to be applied) and applied methodology/32/. The monitoring results were recorded consistently as per the approved frequency in the monitoring plan/3/. | |

### E.6.3. Comparison of monitored parameters with last monitoring period

| | |
|---|---|
| **Means of verification** | This is the 1st monitoring period. PP has provided the values from this monitoring period for each monitoring parameters in the MR.<br>Due to this is the 1st monitoring period, hence no comparison results are needed. |
| **Findings** | N/A |
| **Conclusion** | Due to this is the 1st monitoring period, hence no comparison results are needed. |

### E.6.4. Compliance of the sampling implementation with the registered sampling plan

| | |
|---|---|
| **Means of verification** | The sampling implementation has been carried out in accordance with the sampling plan contained in the PDD/3/.<br>**Sampling Design/Size/Target Population**:<br>Sampling plan was provided by PP and has demonstrated in the PDD. The average animal weight of a defined livestock population at the project site ($W_{site}$) is monitored by sampling method as per the PDD and applied methodology.<br>The project activity applies stratified sampling method and simple random sampling for monitoring animal weight of a defined livestock population at the project site ($W_{site}$), and the sample size is calculated as 423 as per the PDD. Via checking the calculation sheet of sample size/28/, the sample size is confirmed as correct which has been verified according to "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities"/34/.<br>The sample size of each farm was decided on the proportion of the number of each farm in the total number of 5 swine farms. To be conservative, both the samples number of the 5 subsidiary farms is adjusted to be integer value. As a result, total 441 samples of swine population were selected within the project boundary using Excel to ensure conservation.<br>Furthermore, as per the applied methodology, to ensure representativeness, each defined livestock population has been classified into a minimum of three age |

categories including Nursery phase, Growing phase and Mature phase, hence to be conservative, both the samples number of the three age categories is adjusted to be integer value.

Finally, the PP has selected total 441 samples of swine population and the distribution of the samples for three age categories in each swine farm have been clearly and correctly determined as listed in the MR.

The sampling plan is confirmed as in line with the GS requirement, CDM sampling standard and guideline and applied methodology.

**Sampling Frame:**

All the swine population in 5 swine farms are considered as the sampling frame.

**Sampling Selection:**

The PP has applied Stratified Sampling Method and Simple Random Sampling for all over the swine population with three age categories.

**Implementation of Sampling Method:**

Refer to section E.5 of this report for detail assessment of the Sampling Method used for this monitoring period.

**Reliability and precision calculation:**

According to Guidelines for Sampling and surveys of CDM project activities and programmes of activities (Version 04.0)/34/, confidence/precision have been checked as follows:

**The stratified estimated overall mean:**

The sample estimated of the overall mean operation hours is confirmed to be calculated with the equation below as per "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities"/34/:

$$m_{strat} = \sum_{i=a}^{k} \frac{g_i}{N} \times m_i$$

Where:

| | |
|---|---|
| $m_{stra}$ | is the stratified estimated overall mean; |
| $g_i$ | is the size of the $i^{th}$ district where $i$=a,…,k; |
| $N$ | is the population total (413,970); |
| $m_i$ | is the mean of the $i^{th}$ district where $i$=a,…,k. |

**The standard error of the stratified estimated overall mean:**

The standard error of the stratified estimated overall mean is confirmed to be calculated as per "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities"/34/:

$$s.e.(m_{strat}) = \sqrt{\sum_{i=a}^{k} (\frac{g_i}{N})^2 \times (1 - \frac{n_i}{g_i}) \times \frac{SD_i^{\,2}}{n_i}}$$

Where:

| | |
|---|---|
| $s.e.(m_{strat})$ | is the standard error of the stratified estimated overall mean; |
| $g_i$ | is the size of the $i^{th}$ district where $i$=a,…,k; |
| $N$ | is the population total (413,970); |
| $n_i$ | is the number of sampled units the $i^{th}$ district where $i$=a,…,k; |
| $SD_i^2$ | is the variance of the $i^{th}$ district where i=a,…,k. |

**t-value:**

T-value depends on (i) the level of confidence and (ii) the size of the sample. The t-value associated with 95% confidence and the sample size of 441 is confirmed to be 1.9654 as derived in Microsoft Excel using the TINV function following "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities"/34/.

**d. Precision:**

The precision associated with an estimate is confirmed to be: t-value × standard error of the mean as per "Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities"/34/.

**Calculation results**

According to "Standard for Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)"/33/, the desired confidence level is 95% and the desired precision is 10%. Hence, calculation results is therefore confirmed to be:

| Period | t-value | $m_{strat}$ | s.e. ($m_{strat}$) | Precision | Relative Precision |
|---|---|---|---|---|---|
| 2022/01/01-2022/01/31 | 1.9654 | 6236.49 | 1.2328 | 2.4229 | 0.04% |
| 2022/02/01-2022/02/28 | 1.9654 | 6185.91 | 1.2137 | 2.3853 | 0.04% |
| 2022/03/01-2022/03/31 | 1.9654 | 6247.69 | 1.1891 | 2.3371 | 0.04% |
| 2022/04/01-2022/04/30 | 1.9654 | 6135.68 | 1.2151 | 2.3882 | 0.04% |
| 2022/05/01-2022/05/31 | 1.9654 | 6147.01 | 1.2002 | 2.3587 | 0.04% |
| 2022/06/01-2022/06/30 | 1.9654 | 6214.74 | 1.2133 | 2.3847 | 0.04% |
| 2022/07/01-2022/07/31 | 1.9654 | 6224.54 | 1.1913 | 2.3413 | 0.04% |
| 2022/08/01-2022/08/31 | 1.9654 | 6243.06 | 1.2101 | 2.3782 | 0.04% |
| 2022/09/01-2022/09/30 | 1.9654 | 6163.13 | 1.1940 | 2.3467 | 0.04% |
| 2022/10/01-2022/10/31 | 1.9654 | 6178.97 | 1.2156 | 2.3891 | 0.04% |
| 2022/11/01-2022/11/30 | 1.9654 | 6197.82 | 1.1823 | 2.3236 | 0.04% |
| 2022/12/01-2022/12/31 | 1.9654 | 6139.17 | 1.2103 | 2.3788 | 0.04% |

The relative precision is less than 10%. The data are within the required specification. Therefore, CTI verified that the required confidence/precision has been met.

As per the MR, for monitoring the $W_{site}$, according to "Standard: Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)", the desired confidence level is 95% and the desired precision is 10%. According to statistical principles and sampling survey method, 441 samples is sufficient to satisfy the desired confidence and precision. Hence PD has taken 441 samples for measuring the weight and record all the weight in the record the animal weight of the samples, due to the record only have the values of 441 samples, VVB did not have to do the sampling check of the records from 441 samples, VVB checked all the data of 441 samples and no acceptance sampling method need to be done for all the 441 samples in the records.

The sampling method conducted by PD is verified as stated in the verification report: The method of calculation of sample size is checked by CTI by checking the calculation sheet of sample size, 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)" and PP has used 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)" and is verified consistent with PDD.

As per the above explanation, VVB could not weight the swine during site visit, due to the safety reason and considering the swine fever impacts, people outside the swine farms are not allowed to be inside the swine farms but can only do the AWMS plants inspection. Hence no such sample results conducted by VVB for the checking the weight of the swine during site visit. And furthermore, due to the swine which has been sampled by PD is during the monitoring period, and VVB can only do the verification after the monitoring period ended, so when the VVB does the on-site check, it is not possible for VVB to check the PP sampled swine as these swine has raised with more weight or be sold to the market with the time passed. So, actually, VVB can't do the acceptance sampling during the site visit time as the

| | |
|---|---|
| | samples from PD will not have the same weight with the PD's measuring.<br>Therefore, to cross-check the weight data of the PD's samples, VVB has checked the public information of the weight of market swine[9,10] and breeding swine[11,12] in different categories including Nursery phase, Growing phase and Mature phase, it is confirmed that the average weight data for different categories are reasonable and thus the sampling results by PD are acceptable. |
| **Findings** | N/A |
| **Conclusion** | The verification team has found out that the sampling plan applied is found to be in-line with the monitoring plan mentioned in the PDD/3/ and Sampling and survey standards/33/ and guideline/34/. |

## E.7. Assessment of data and calculation of SDG impacts

### E.7.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

| | |
|---|---|
| **Means of verification** | ***SDG 7 Baseline Impact:***<br>Via checking the MR and through interview with local residents, CTI confirmed that the electricity can be produced in project activity.<br>In the baseline situation, as per the interview with end users, CTI verified that 0 MWh electricity produced without the project activity. Therefore, Baseline Impact is zero.<br><br>***SDG 8 Baseline Impact:***<br>Via checking the MR and through interview with representative of staffs, CTI confirmed that the project created jobs<br>In the baseline situation, as per interview with representative of staffs, CTI verified that no new full-time job created without this project. Therefore, Baseline Impact is zero.<br><br>***SDG 13 Baseline Impact:***<br>Via checking the MR/1/ and through checking the emission reduction calculation sheet/2/, CTI confirmed that the amount of GHGs emission avoided or sequestered in baseline is 0 $tCO_2e$. Therefore, Baseline Impact is zero. |
| **Findings** | N/A |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section E.6.2 of this report);<br>c) Appropriate methods and formulae are used for calculating baseline SDG impact;<br>d) Appropriate emission factors and other reference values were correctly applied.<br>e) The calculation of baseline situation of each SDG impact is correct. |

### E.7.2. Calculation of project value or estimation of project situation of each SDG Impact

| | |
|---|---|
| **Means of verification** | ***SDG 7 Project Impact:***<br>For SDG 7, the project installs new animal waste management systems by replace the current open anaerobic lagoons and utilized biogas for power generation, as assessed in E.6.2, CTI verified that the<br>From 01/01/2022 to 31/12/2022, 40,200 MWh of electricity produced, |

[9] https://www.ziyunlou.com/article/2pdr12.html#:~:text=%E7%8C%AA%E7%9A%84%E7%94%9F%E9%95%BF%E5%8F%91%E8%82%B2%E9%98%B6%E6%AE%B5,%E4%B8%8A%E5%B8%82%EF%BC%89%E5%9B%9B%E4%B8%AA%E9%98%B6%E6%AE%B5%E3%80%82

[10] https://www.jiangxiqicheng.com/96258.html

[11] https://zhuanlan.zhihu.com/p/369296668

[12] https://baike.baidu.com/item/%E7%A7%8D%E7%8C%AA/7148836

Therefore, the SDG 7 Project Impact for this monitoring period from 01/01/2022 to 31/12/2022 is total 40,200 MWh of electricity produced.

***SDG 8 Project Impact:***

For SDG Indicator 8,

From 01/01/2022 to 31/12/2022, 10 full-time jobs created (including 5 females and 5 males) which is verified in section E.6.2.

For this monitoring period from 01/01/2022 to 31/12/2022, 10 full-time jobs created (including 5 females and 5 males) which is verified in section E.6.2.

Hence CTI confirmed the project is beneficial to local stakeholders.

***SDG 13 Project Impact:***

As per section B.6.1 of the PDD, the amount of GHGs emissions avoided or sequestered is calculated equal to baseline emission – project emissions – leakage emissions, and the baseline emission, project emissions, leakage emissions are determined by ACM0010" GHG emission reductions from manure management systems (Version 08.0)", the specific calculation method and calculation result in this monitoring period are described as follows:

***Baseline Emissions $BE_y$ Calculation Assessment:***

Via checking the PDD and 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 $CO_2$e/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 $AWMS_j$. 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: $VS_{LT,y}$**

As per the methodology, there are four options to determine this value, via checking the options provided, CTI confirmed there is no published country specific data available based on the local expertise of 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) $B_{0,LT}$**

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 Sichuan 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, chapter10/59/.
CTI verified that the $B_{0,LT}$ values applicable for the project which has been assessed in the validation process/4/.

**(D) $MCF_j$**

As per the applied methodology, the MCF values given in table 10.17, chapter 10, volume 4, IPCC 2006 Guidelines/59/ should be used. MCF values depend on the annual average temperature where the anaerobic manure treatment facility in the baseline exist

i. For this monitoring period, the annual average temperature is confirmed as 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture, while the lowest temperature in ex-ante estimated is 16 ℃, the value of 75% applied is verified as consistent with IPCC/59/.

ii. A conservativeness factor should be applied by multiplying MCF values (estimated as per above bullet) with a value of 0.94, to account for the 20% uncertainty in the MCF values as reported by IPCC 2006/59/.

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

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

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) |

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

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 (kg$N_2O$-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 CDM-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/ (1,000 kg animal mass)/ day, table 10.19, chapter 10, volume 4 of IPCC 2006 Guidelines

TAM = Typical animal mass for livestock in kg/animal

**3. Baseline $CO_2$ 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 electricity 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/21/, 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 and used by the 5 swine farms. So, the baseline $CO_2$ emission from electricity and/or heat used in the baseline is 0, which is conservative.

The values monitored during monitoring survey are transparently shown in the Monitoring Report Section D.2. During onsite, the verification team cross-checked these values in detail using various supporting records and documents. Refer to the section E.6.1 and E.6.2 of this report for ex-ante and ex-post parameters' assessment.

The **SDG 13 Baseline Impact** (Baseline emission calculation) is provided in the Emission reduction calculation spreadsheet/2/ in a transparent manner and the calculation found correct. There is no material error noted in the accounting and application of various data against monitored parameters.

The Baseline Impact for SDG 13 during this monitoring period is summarized as below,

| Date | $BE_{CH4,y}$ ($tCO_2e/yr$) | $BE_{N2O,y}$ ($tCO_2e/yr$) | $BE_y$ ($tCO_2e/yr$) |
|---|---|---|---|
| 01/01/2022-31/12/2022 | 337,651 | 5,346 | **342,997** |
| **01/01/2022-31/12/2022** | 337,651 | 5,346 | **342,997** |

Total Baseline Impact for SDG 13 (baseline emissions) of the 1st monitoring period (01/01/2022-31/12/2022) is thus verified as 342,997 $tCO_2e$.

***Project Emission Calculation Assessment:***

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)

**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 $CO_2e$)

**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 electricity generation" (version 03.0).

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

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 electricity generation for source *j* in year *y* (t $CO_2$/MWh) |
| $TDL_{j,y}$ | = | Average technical transmission and distribution losses for providing electricity to source *j* in year *y* |

During this monitoring period, via site inspection and checking the electricity data record as assessed in section E.6.2, it is confirmed that the electricity consumed by the project came from the grid company

**b. $PE_{FC,y}$**

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

**c. $PE_{flare,y}$**

Via site inspection and checking the flow meter records as assessed in section E.6.2 for parameter $v_f$, it is confirmed that for this monitoring period, there was no residual gas stream flared by flaring, hence $PE_{flare,y}$=0

**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)"/39/. 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:

$$PE_{CH4,y} = Q_{CH4,y} * EF_{CH4,default} * GWP_{CH4} \quad (15)$$

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 $CH_4$) |

**$Q_{CH4,y}$**

As per PDD, 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., $Q_{CH4,y} = \sum_{i=1}^{8760} F_{i,t}$

Hence the mass flow of greenhouse Ias *i* ($F_{i,t}$) is determined as follows:

$$F_{i,t} = V_{t,db} * \upsilon_{i,t,db} * \rho_{i,t} \quad (16)$$

$$\rho_{i,t} = \frac{P_t * MM_i}{R_u * T_t} \quad (17)$$

Where:

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

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

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

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

$P_t$ = Absolute pressure of the gaseous stream in time interval *t* (Pa)

$MM_i$ = Molecular mass of greenhouse gas *i* (kg/kmol)

$R_u$ = Universal ideal gases constant (Pa.m$^3$/kmol.K)

$T_t$ = Temperature of the gaseous stream in time interval *t* (K)

In summary, for this monitoring period, the final determined Project emission of $\mathbf{PE_{AD,y}}$ is calculated as

$$\mathbf{PE_{AD,y} = PE_{EC,y} + PE_{flare,y} + PE_{CH4,\,y}}$$

**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.

$$PE_{Aer,y} = GWP_{CH4} * D_{CH4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^{N}\left(1 - R_{VS,n}\right)\right] * \sum_{j,LT}\left(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j\right) + PE_{sl,y} \quad (18)$$

No sludge will be produced in the process of the manure treatment system in this project. So the $PE_{sl,y}$=0.

So,

$$PE_{Aer,y} = GWP_{CH4} * D_{CH4} * 0.001 * F_{Aer} * \left[\prod_{n=1}^{N}\left(1 - R_{VS,n}\right)\right] * \sum_{j,LT}\left(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j\right) \quad (19)$$

Where:

$GWP_{CH4}$ = Global Warming Potential (GWP) of $CH_4$ (t $CO_2$e/t$CH_4$)

$R_{VS,n}$ = 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$^3$$CH_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 $CO_2$e/yr)

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

**iii). $PE_{N2O,y}$**

$$PE_{N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * \left(E_{N2O,D,y} + E_{N2O,ID,y}\right) \quad (20)$$

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:**

$$E_{N2O,D,y} = \sum_{j,LT} EF_{N2O,D,j} * NEX_{LT,y} * N_{LT} * MS\%_j \quad (21)$$

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)

$$E_{N2O,ID,y} = \sum_{j,LT} \mathrm{EF_{N2O,ID}} * \mathrm{F_{gasMS,j,LT}} * \mathrm{NEX_{LT,y}} * \mathrm{N_{LT}} * \mathrm{MS\%_j} \quad (22)$$

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 (kg$N_2O$-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) $PE_{elec/heat}$**

$$PE_{EC/FC,y} = PE_{EC,y} + \sum_j PE_{FC,j,y} \quad (23)$$

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 equipIent 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).<br><br>Via site inspection, CTI confirmed there is no consumption of electricity or heat related to the anaerobic digester. Hence, these emissions should not be considered.<br><br>Besides, as described in above, since the electricity consumption that is not related to the anaerobic digester cannot be separated from the total electricity consumption, therefore the emission for consumption of electricity is calculated in $PE_{EC,y}$.<br><br>The same for the $PE_{EC,y}$, please refer to $PE_{EC,y}$ calculation in above.<br>Therefore, $PE_{elec/heat}$=0.<br><br>The values monitored during monitoring survey are transparently shown in the Monitoring Report Section D.2. During onsite, the verification team cross-checked these values in detail using various supporting records and documents. Refer to the section E.6.1 and E.6.2 of this report for ex-ante and ex-post parameters' assessment.<br>The **SDG 13 Project Impact** (Project emission calculation) is provided in the Emission reduction calculation spreadsheet/2/ in a transparent manner and the calculation found correct. There is no material error noted in the accounting and application of various data against monitored parameters.<br>The Project Impact for SDG 13 during this monitoring period is summarized as below, |

| Date | $PE_{AD,y}$ ($tCO_2e/yr$) | $PE_{Aer,y}$ ($tCO_2e/yr$) | $PE_{N2O,y}$ ($tCO_2e/yr$) | $PE_y$ ($tCO_2e/yr$) |
|---|---|---|---|---|
| 01/01/2022-31/12/2022 | 18,281 | 96 | 19,383 | **37,760** |
| **01/01/2022-31/12/2022** | 18,281 | 96 | 19,383 | **37,760** |

Total Project Impact for SDG 13 (project emissions) of the 1st monitoring period (01/01/2022-31/12/2022) is thus verified as 37,760 $tCO_2e$.

| | |
|---|---|
| **Findings** | N/A |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section E.6.2. of this report);<br>c) Appropriate methods and formulae for calculating project SDG impact were followed;<br>The calculation of project situation of each SDG impact is correct. |

### E.7.3. Calculation of leakage

| | |
|---|---|
| **Means of verification** | 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.<br><br>$$LE_y = \left(LE_{PJ,N2O,y} - LE_{BL,N2O,y}\right) + \left(LE_{PJ,CH4,y} - LE_{BL,CH4,y}\right) + LE_{AD,y} \quad (24)$$<br><br>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 $CO_2$

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

$$LE_{BL,N2O,y} = GWP_{N2O} * CF_{N2O-N,N} * \frac{1}{1000} * (LE_{N2O,land,y} + LE_{N2O,runoff,y} + LE_{N2O,vol,y}) \quad (25)$$

$$LE_{N2O,land,y} = EF_1 * \prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (26)$$

$$LE_{N2O,runoff,y} = EF_5 * F_{leach} * \prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (27)$$

$$LE_{N2O,vol,y} = EF_4 * \prod_{n=1}^{N}(1 - R_{N,n}) * F_{gasm} * \sum_{LT} NEX_{LT,y} * N_{LT} \quad (28)$$

Where:

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

$CF_{N2O-N,N}$ = 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, $LE_{PJ,\ N2O}$**

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

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

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

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

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) |

It is 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, $\prod_{n=1}^{N}(1 - R_{N,n}) * \sum_{LT} NEX_{LT,y} * N_{LT}$ should be substituted 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:

$$LE_{BL,CH4,y} = GWP_{CH4} * D_{CH4} * MCF_d * \left[\prod_{n=1}^{N}(1 - R_{VS,n})\right] * \sum_{j,LT}(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (33)$$

$$LE_{PJ,CH4,y} = GWP_{CH4} * D_{CH4} * MCF_d * \left[\prod_{n=1}^{N}(1 - R_{VS,n})\right] * \sum_{j,LT}(B_{0,LT} * N_{LT} * VS_{LT,y} * MS\%_j) \quad (34)$$

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) 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)/39/.

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:

$$LE_{AD,y} = LE_{storage,y} + LE_{comp,y} \quad (35)$$

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 $CO_2e$)

For subsequent treatment stages, the reduction of the nitrogen during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with nitrogen adjusted for the reduction from the previous treatment stages by multiplying by (1-$R_N$), where $R_N$ is the relative reduction of nitrogen from the previous stage. The relative reduction ($R_N$) of nitrogen depends on the treatment technology and should be estimated in a conservative manner. Default values for different treatment technologies can be found in appendix 1 (values for TN).

The anaerobic digestion process of this project is carried out in a fully enclosed system, the flaring will be not taken into account as the equipment will only be used when there will be surplus biogas, normally there will be no surplus biogas during the operational period of the project. After anaerobic digestion, the fermented sludge will be treated in aerobic composting system, which will be used as fertilizer. Wastewater from the new animal waste management systems 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.

The values monitored during monitoring survey are transparently shown in the Monitoring Report Section D.2. During onsite, the verification team cross-checked these values in detail using various supporting records and documents. Refer to the section E.6.1 and E.6.2 of this report for ex-ante and ex-post parameters' assessment.

The leakage emission calculation is provided in the Emission reduction calculation spreadsheet/2/ in a transparent manner and the calculation found correct. There is no material error noted in the accounting and application of various data against monitored parameters.

The leakage calculation during this monitoring period is summarized as below,

| Date | $LE_{p,CH4}$ | $LE_{B,CH4}$ | $LE_{B,N2O}$ | $LE_{P,N2O}$ | $LE_y$ |
|---|---|---|---|---|---|
| | ($tCO_2e$) | ($tCO_2e$) | ($tCO_2e$) | ($tCO_2e$) | ($tCO_2e$) |
| 01/01/2022-31/12/2022 | 76,631 | 71,840 | 3,809 | 13,572 | 14,554 |
| **01/01/2022-** | 76,631 | 71,840 | 3,809 | 13,572 | **14,554** |

| | |
|---|---|
| | 31/12/2022 \| \| \| \| \| \| |
| | Total leakage emissions of the 1st monitoring period (01/01/2022-31/12/2022) is thus verified as 14,554 $tCO_2e$. |
| **Findings** | CAR 05 was raised and resolved.<br>Refer to Appendix 4 in this report for detail assessment. |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section E.6.2. of this report);<br>c) Appropriate methods and formulae for calculating leakage were followed;<br>The calculation of project leakage emissions is correct. |

### E.7.4. Calculation of net benefits or direct calculation for each SDG Impact

| | |
|---|---|
| **Means of verification** | Calculation of net benefits as difference of baseline and project values or direct calculation for each SDG impact is as following,<br>***SDG 7 impact net benefit***<br>Net Benefit SDG 7 for 01/01/2022 to 31/12/2022 = Project Impact of SDG7 (40,200 MWh of electricity produced) – Baseline Impact of SDG7 (0) =40,200 MWh of electricity produced<br>***SDG 8 impact net benefit***<br>From 01/01/2022 to 31/12/2022, Net Benefit SDG 8 (Total number of jobs) = Project Impact of SDG8 (10 full-time jobs created (5 females and 5 males)) – Baseline Impact of SDG8 (0) =10 full-time jobs created (5 females and 5 males)<br>***SDG 13 impact net benefit***<br>In accordance with applied methodology, registered PDD and validation report,<br>Net Benefit SDG 13 (Amount of GHGs emission avoided or sequestered) = baseline emission – project emission – leakage emission = 342,997 $tCO_2e$ -37,760 $tCO_2e$ -14,554 $tCO_2e$ = 290,683 $tCO_2e$<br>Furthermore, as per the applied methodology and PDD, if the actual methane captured from anaerobic digesters in project activity is lower than ($BE_{CH4,y}$ - $PE_{AD,y}$), then ($BE_{CH4,y}$ - $PE_{AD,y}$) is replaced by actual methane captured $Q_{CH4,y}$.<br>Biogas captured during monitoring period is 31,929,871.17 $m^3$, which equals to 344,714 $tCO_2e$. Baseline methane emission ($BE_{CH4,y}$) is 337,651 $tCO_2e$. project emissions associated with anaerobic digester is ($PE_{AD,y}$) is 18,281 $tCO_2e$. Actual methane captured from anaerobic digesters is higher than the difference of $BE_{CH4,y}$ and $PE_{AD,y}$.<br>Therefore, the equation ($BE_{CH4,y}$ - $PE_{AD,y}$) can be used to calculate emission reduction.<br>**Emission Reductions Calculation**<br>**Parameters / Period** \| **Baseline Emissions $BE_y$ ($tCO_2e$)** \| **Project Emissions $PE_y$ ($tCO_2e$)** \| **Leakage Emissions $LE_y$ ($tCO_2e$)** \| **Emission Reductions $ER_y$ ($tCO_2e$)**<br>**01/01/2022-31/12/2022** \| **342,997** \| **37,760** \| **14,554** \| **290,683**<br>All the figures as per the monitoring report were cross-checked by the verification team against basic monitored data. Refer to section E.6.2 for detail assessments. |
| **Findings** | N/A |
| **Conclusion** | The verification team confirms that<br>a) The complete data was available and is duly reported;<br>b) As indicated above, the description with regard to cross-check of reported data is included under respective parameter (refer Section E.6.2 of this report);<br>c) Appropriate methods and formulae for calculating net benefits for each SDG impact were followed; |

| | |
|---|---|
| | The calculation of net benefits for each SDG impact is correct. |

### E.7.5. Comparison of actual value of impacts with estimates in approved PDD

| | |
|---|---|
| **Means of verification** | The verification team has checked if the MR includes a comparison of actual values of the monitoring period with the estimations in the PDD for each SDG impact. Conclusion is as below table |

| Item | Values estimated in ex ante calculation of approved PDD | Actual values achieved during this monitoring period |
|---|---|---|
| SDG 7 | 51,854 MWh of electricity produced | 40,200 MWh of electricity produced |
| SDG 8 | 10 full-time jobs created (5 females and 5 males) | 10 full-time jobs created (5 females and 5 males) |
| SDG 13 | 355,531 $tCO_2e$ | 290,683 $tCO_2e$ |

| | |
|---|---|
| **Findings** | N/A |
| **Conclusion** | The MR includes a summary table of comparison of actual values of the monitoring period with the estimations in the approved PDD for each SDG impact and the comparison results are confirmed as correct. |

### E.7.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

| | |
|---|---|
| **Means of verification** | For SDG 7, the actual outcome was 40,200 MWh of electricity produced, which is lower than the estimated value, due to the estimated value in the PDD is the theoretical value estimated basing on amount of manure produced from the number of animals theoretically as value provided in PER/7/, while the actual value is monitored by electricity meters. It is acceptable that the actual value is lower than estimated in PDD.<br><br>For SDG 8, total number of jobs created is 10 (including 5 females and 5 males) by the project during the 1st monitoring period is same to the PDD.<br><br>For SDG 13, CTI confirmed that the actual value during this monitoring period was found to be 18.24% lower than ex-ante estimated value the for this project during this monitoring period, via comparing with the PDD estimated value, CTI verified that the change of three parameters, i.e. the number of animals in the swine farm ($N_{LT}$), the average animal weight ($W_{site}$) and the actual biogas captured from anaerobic digester impact the actual emission reduction calculation, however these parameters depend on the actual implementation of farms and growth of the swine which changes over time and can't be controlled by PP. Hence CTI verified that the actual value slightly lower than estimated in PDD is reasonable and acceptable. |
| **Findings** | N/A |
| **Conclusion** | The actual SDG impacts for 7 and 13 are lower than the estimated values given in the validated PDD/3/, which is assessed as appropriate and accepted. |

### E.8. Safeguards reporting

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|---|---|
| **Means of verification** | Via checking the Section D.1 and Appendix 1 in PDD, CTI confirmed that there is one Safeguarding principle need to be monitored with assessment question answered 'Potentially' i.e. in case of biogas is not handled properly during the operation period of the project, methane explosion may be caused.<br>This parameter has been monitored and assessed in section E.6.2. hence, it is confirmed that during this monitoring period, no biogas explosion or leakage was occurred.<br>And via site visit and interview with local stakeholders, CTI verified that the project was implemented normally and in line with the design in the PDD, there was no information on any assessment questions answered 'Potentially' related to Safeguarding principles.<br>All the Information on any assessment questions answered as "No", so there is no |

| | |
|---|---|
| | need to re-assessment the Safeguarding principles. |
| **Findings** | N/A |
| **Conclusion** | Except one 'Potentially' assessment question has been monitored, all the Information on any assessment questions answered as "No", so there is no need to re-assessment the Safeguarding principles during this monitoring period. |

### E.9. Stakeholder inputs and legal disputes

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|---|---|
| **Means of verification** | As confirmed through the onsite visit and interview with the local stakeholders, CTI verified that the inputs/grievances mechanism has been in place. As per onsite checking the Grievance Books/31/ and internet/email address which has been provided during the validation process and interview with PP and local stakeholders, CTI verified that they have access to provide issues or comments through given methods.<br>And via checking the different approach, CTI verified that there were no inputs/grievances received during this monitoring period. |
| **Findings** | CAR 06 was raised and resolved.<br>Refer to Appendix 4 in this report for detail assessment. |
| **Conclusion** | All the methods of continuous input /grievance mechanism are confirmed during on-site investigation and interviews.<br>CTI verified that there were no comments/complaints received from the stakeholders during this monitoring period of the project activity. |

## SECTION F. Internal quality control

The final verification report was undergone a technical review by a qualified independent reviewer before requesting issuance 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 G. Verification opinion

The verification team assigned by the VVB (CTI) concludes that the 1$^{st}$ periodic verification of GS programme of activities "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" in Sichuan Province, China, as described in the validated PDD and final version of monitoring report, meets all relevant requirements set by the Gold Standard for the Global Goals Principles and Requirements.

The project activity was correctly implemented according to selected monitoring methodology and monitoring plan. The collected monitoring data allowed to verify the amount of achieved SDG impacts. And the project is contributed to sustainability development. Thus, the VVB is pleased to issue a positive verification opinion.

## SECTION H. Certification statement

Shenzhen CTI International Certification Co., Ltd (CTI) has performed the 1st periodic verification of the SDG outcomes that have been reported for the GS project activity "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" in Sichuan Province, P. R. China for the monitoring period from 01/01/2022 to 31/12/2022.

The verification is based on the baseline and monitoring methodology ACM0010 "GHG emission reductions from manure management systems" (Version 08.0), the PDD, and the final version of monitoring report. The verification 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; iii) resolution of outstanding issues and the issuance of the final verification and certification report.

The PPs are responsible for the collection, calculation and determination of the SDG impacts data in accordance with the monitoring plan and the reporting of SDG impacts on the basis set out within the project monitoring report.

It is CTI's responsibility to provide an independent verification statement on the reported SDG impacts for the project. Based on an understanding of the risks associated with reporting of SDG impacts data and the controls in place to mitigate these, CTI planned and performed our work to obtain the information and explanations that we considered necessary to provide reasonable assurance that reported SDG impacts are fairly stated.

CTI confirms that the SDG impacts are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that SDG impacts are appropriately calculated, CTI confirms that the SDG impacts from the "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" in Sichuan Province, P. R. China during the monitoring period from 01/01/2022 to 31/12/2022 as follows:

Monitoring period Number: 1st

Monitoring period: 01/01/2022 to 31/12/2022

The verified amount of impact for each SDG in the PA as per commitment period is stated below;

| **SDG No.** | **Contribution for Vintage year** | **Total for this MP** |
|---|---|---|
| | **01/01/2022 to 31/12/2022** | **01/01/2022 to 31/12/2022** |
| SDG 7 | 40,200 MWh of electricity produced | 40,200 MWh of electricity produced |
| SDG 8 | 10 full-time jobs created (5 females and 5 males) | 10 full-time jobs created (5 females and 5 males) |
| SDG 13 | 290,683 $tCO_2e$ of GHGs emission avoided or sequestered | 290,683 $tCO_2e$ of GHGs emission avoided or sequestered |

# Appendix 1. Abbreviations

| Abbreviations | Full texts |
|---|---|
| AMS | Approved Methodology for SSC Projects |
| AWMS | Animal Waste Management System |
| BE | Baseline Emission |
| CAR | Corrective Action Request |
| CDM | Clean Development Mechanism |
| CL | Clarification Request |
| $CO_2$ | Carbon dioxide |
| CP | Crediting Period |
| 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 |
| PDD | Project Design Document |
| PE | Project Emission |
| PP | Project Participant |
| PS | Project Standard |
| QC/QA | Quality control/Quality assurance |
| SCR | Stakeholder Consultation Report |
| SD | Sustainable Development |
| SDG | Sustainable Development Goals |
| SFR | Stakeholder Feedback Round |
| $tCO_2e$ | Tonnes of Carbon dioxide 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

## Ms. Shunrong LIN

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

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

| Scope | Technical Area |
|---|---|
| SS 1: Energy industries (renewable/non-renewable sources) | TA 1.2: Energy generation from renewable energy sources |
| SS 3: Energy demand | TA 3.1: Energy demand |
| SS 13: Waste handling and disposal | TA 13.1: Solid waste and wastewater |
| | TA 13.2: Manure |
| SS 14: Afforestation and reforestation | TA 14.1: Afforestation and reforestation |
| SS 15: Agriculture | TA 15.1: Agriculture |

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

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 25/10/2022

# Mr. Wu LIN

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

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

| Scope | Technical Area |
|---|---|
| SS 1: Energy industries (renewable/non-renewable sources) | TA 1.1: Thermal energy generation |
| | TA 1.2: Energy generation from renewable energy sources |
| SS 2: Energy distribution | TA 2.1: Electricity distribution |
| SS 3: Energy demand | TA 3.1: Energy demand |
| 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 10: Fugitive emissions from fuels (solid, oil and gas) | TA 10.1: Fugitive emissions from oil and gas |
| 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:

Lu ZHOU

General Manager

Shenzhen, 01/01/2021

# Appendix 3. Documents reviewed or referenced

| No | Author | Title | References to the document | Provider |
|---|---|---|---|---|
| 1. | PP | 1st periodic Monitoring Report of "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" | - Version No. 01, dated 04/01/2023<br>- Version No. 02, dated 15/02/2023<br>- Version No. 03, dated 24/05/2023 | PP |
| 2. | PP | 1st periodic Emission Reduction Calculation spreadsheet of "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" | - Version No. 01, dated 02/01/2023 | PP |
| 3. | PP | GS4GG Project Design document of "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" | - Version No. 03, dated 12/05/2023 | PP |
| 4. | CTI | Validation report of "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" | - Version No. 2.0, dated 18/07/2023 | N/A |
| 5. | PP | Stakeholder Consultation Report of "Tieqilishi AWMS GHG Mitigation Project in Sichuan Province" | - Version No. 02, dated 15/02/2023 | PP |
| 6. | Local Market Supervision and Administration Bureau | Business License of PP | Business License of Sichuan Tieqilishi Food Co., Ltd. and Sirreon Technology and Development (Beijing) Co., Ltd. | PP |
| 7. | Nanyang Institute of Environmental Protection Science Co., Ltd. | Environment Impact Assessment (EIA) | Issued in February 2021 | PP |
| 8. | Sichuan Department of Ecology and Environment | EIA approval | Issued on 22/04/2021 | PP |
| 9. | PP and manufacturers | Equipment purchase contracts | Equipment purchase contracts of all the involved main equipment,<br>a. biogas generator, signed on 28/07/2021<br>b. flare system, signed on 11/08/2021<br>c. turnover machine signed on 15/08/2021<br>d. anaerobic tanks signed on 05/08/2021 | PP |
| 10. | PP and Leshan Qinli Agriculture Development Co., Ltd. | General Construction Contract | General Construction Contract of the project signed on 21/08/2021 | PP |
| 11. | Manufacturers | Technical agreement | Technical agreement of main equipment | PP |
| 12. | PP | Operation log of the project | Operation log of the project | PP |
| 13. | Chengdu Institute of Metrology | Calibration Reports | Calibration Reports to all the electricity meters with validity covering this monitoring period | PP |

| | | | | |
|---|---|---|---|---|
| | Verification and Testing | | Calibration Reports to all the Weight measurers with validity covering this monitoring period | |
| | | | Calibration Reports to all the Electronic truck scale with validity covering this monitoring period | |
| | | | Calibration Reports to all the biogas analysers with validity covering this monitoring period | |
| | | | Calibration Reports to all the flow meters with validity covering this monitoring period | |
| 14. | General Administration of Quality Supervision, Inspection and Quarantine | Certificate of Metrological Authorization | The State Certificate for the Gradation of the Certified Reference Materials of Nanjing Changyuan Industrial Gas Co., Ltd issued on 06/09/2017 | PP |
| | Sichuan Provincial Bureau of Quality and Technical Supervision | | Certificate of Metrological Authorization of Chengdu Institute of Metrology Verification and Testing issued on 28/10/2018 valid to 27/10/2023 | PP |
| 15. | PP | Export record form of Market swine | Export record form of Market swine of each farm covering this monitoring period | PP |
| 16. | PP | Records of animal weight | Monthly records of animal weight of a defined livestock population of three age categories | PP |
| 17. | PP | Sale Records of Marketing swine | Monthly Sale Records of Marketing swine of each farm covering this monitoring period | PP |
| 18. | PP | Breeding Swine stock record | Breeding Swine stock record of each farm covering this monitoring period | PP |
| 19. | PP | Daily operation record | Daily operation record of each treatment plant covering this monitoring period | PP |
| 20. | Jiangsu Hengda | Manufacture specification | Manufacture specification of the flow meter | PP |
| 21. | PP | Photo of baseline lagoon | Photo of baseline lagoons of 5 swine farms | PP |
| 22. | PP | Record keeping book | Record keeping book including employment | PP |
| 23. | PP and employees | Labor contracts | Labor contracts signed with employees for implementation of this project | PP |
| 24. | PP | Record of operation started date of each swine farm | Record of operation started date of each swine farm | PP |
| 25. | PP | Technical Training Records | Technical Training Records of project<br>1. Training Records dated on 26/11/2021 and 15/11/2022 for biogas safety operation<br>2. Annual Training Notices<br>3. Training attendance record | PP |
| 26. | PP | Declaration of no double counting<br>Declaration of not involved in other GHG scheme | Issued on 28/12/2021 | PP |
| 27. | PP | ODA declaration | Declaration of Non-Use of ODA by project owner of GS11712 issued on | PP |

| | | | | |
|---|---|---|---|---|
| | | | 15/02/2023 | |
| 28. | PP | Calculation sheet of sample size | Calculation sheet of sample size for determine the samples of monitoring $W_{site}$ | PP |
| 29. | State Grid Sichuan Electric Power Company | Electricity notes | Electricity notes issued by State Grid Sichuan Electric Power Company corresponding to 5 AWMS which use the electricity from grid for this monitoring period | PP |
| 30. | PP | Daily report of electricity | Daily report of electricity issued by PP for this monitoring period | PP |
| 31. | VVB | Site Visit Photo | Photo taken by verifier during site visit including main equipment, monitoring devices, DCS system, swine farms, ear tags, Grievance Book etc. | N/A |
| 32. | UNFCCC | CDM Approved Small Scale Methodology ACM0010 | "ACM0010 GHG emission reductions from manure management systems" (Version 08.0.0) | UNFCCC website |
| 33. | UNFCCC | Standard of Sampling and surveys | Standard of "Sampling and surveys for CDM project activities and programmes of activities (Version 09.0)" | UNFCCC website |
| 34. | 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 |
| 35. | UNFCCC | Methodological tool | Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0) | UNFCCC website |
| 36. | UNFCCC | Methodological tool | Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0) | UNFCCC website |
| 37. | UNFCCC | Methodological tool | Project emissions from flaring (Version 04.0) | UNFCCC website |
| 38. | UNFCCC | Methodological tool | Tool to determine the mass flow of a greenhouse gas in a gaseous stream (Version 07.0) | UNFCCC website |
| 39. | UNFCCC | Methodological tool | Project and leakage emissions from anaerobic digesters (Version 02.0) | UNFCCC website |
| 40. | UNFCCC | Methodological tool | Common practice (Version 03.1) | UNFCCC website |
| 41. | UNFCCC | Methodological tool | Investment analysis (version 11.0) | UNFCCC website |
| 42. | GS | GS4GG MR template | Gold Standard for the Global Goals Monitoring Report (MR) Template, version 1.1 in October 2020 | GS Website |
| 43. | GS | Gold Standard for the Global Goals Principles and Requirements | Version 1.2 | GS Website |
| 44. | GS | Gold Standard for the Global Goals Safeguarding Principles & Requirements | Version 1.2 | GS Website |
| 45. | GS | Gold Standard for the Global Goals Community Services Activity Requirements | Version 1.2 | GS Website |
| 46. | GS | Gold Standard for the Global Goals Stakeholder Consultation and Engagement Requirements | Version 1.2 | GS Website |
| 47. | GS | GS4GG GHG Emissions | Version 2.1 | GS |

| | | | | |
|---|---|---|---|---|
| | | Reduction & Sequestration Product Requirements | | Website |
| 48. | National Standard | JJG 596-2012 | Electrical Meters for Measuring Alternating-current Electrical Energy | Public website |
| 49. | National Standard | JJG1029-2007 | Verification Regulation of Vortex-shedding Flowmeter | Public website |
| 50. | National Standard | JJG693-2011 | Verification Regulation of Alarmer Detectors of Combustible Gas | Public Website |
| 51. | National Standard | JJG539-2016 | Digital Indicator Scale Verification Regulations | Public Website |
| 52. | China CER platform | CCER | http://cdm.ccchina.org.cn/ccer.aspx | Public Website |
| 53. | UNFCCC | UNFCCC website | https://cdm.unfccc.int | UNFCCC website |
| 54. | VERRA | VCS | https://verra.org/project/vcs-program/ | VCS website |
| 55. | 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 |
| 56. | Ministry of Ecology and Environment of China | Enforced company list | http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf | Public Website |
| 57. | Sichuan Provincial Meteorological Service | Temperature conditions in Mianyang City and Liangshan Yi Autonomous Prefecture for this monitoring period | https://www.tianqi5.cn/sichuan_mianyang_lishitianqi/202212.html | PP |
| 58. | IPCC | IPCC Fifth Assessment Report | IPCC Fifth Assessment Report | Public Website |
| 59. | IPCC | IPCC | 2006 IPCC Guidelines for National Greenhouse Gas Inventories | Public Website |
| 60. | 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 |
| 61. | 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 |
| 62. | China State Council | Regulations on Prevention and Control of Pollution from Livestock and Poultry Farming | http://politics.people.com.cn/n/2013/1126/c1001-23662445.html | Public Website |

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

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

| | | | | |
|---|---|---|---|---|
| **FAR ID** | N/A | **Section no.** | | **Date:** DD/MM/YYYY |
| **Description of FAR** | | | | |
| No FAR from the validation. | | | | |
| **Project participant response** | | | | **Date:** DD/MM/YYYY |
| | | | | |
| **Documentation provided by project participant** | | | | |
| | | | | |
| **VVB assessment** | | | | **Date:** DD/MM/YYYY |
| | | | | |

**Table 2. CL from this verification**

| | | | | |
|---|---|---|---|---|
| **CL ID** | N/A | **Section no.** | - | **Date: -** |
| **Description of CL** | | | | |
| | | | | |
| **Project participant response** | | | | **Date:** |
| | | | | |
| **Documentation provided by project participant** | | | | |
| | | | | |
| **VVB assessment** | | | | **Date:** |
| | | | | |

**Table 3. CAR from this verification**

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 01 | **Section no.** | Cover | **Date: 18/01/2023** |
| **Description of CAR** | | | | |
| In table of Key Project Information, the Date of project design certification is not correct. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| The project has not yet received the design certification, the date has been deleted. | | | | |
| **Documentation provided by project participant** | | | | |
| /1/ version 02 | | | | |
| **VVB assessment** | | | | **Date: 01/03/2023** |
| The revised MR is checked, CTI confirmed that the date has been updated as reasonable.<br>CAR 01 is closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 02 | **Section no.** | A.2 | **Date: 18/01/2023** |
| **Description of CAR** | | | | |
| The figure 1 in section A.2 does not include all the 5 swine farms. Revision is requested. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| The figure 1 has been updated to show the clearer geographic information of each swine farm. | | | | |
| **Documentation provided by project participant** | | | | |
| /1/ version 02 | | | | |
| **VVB assessment** | | | | **Date: 01/03/2023** |
| The revised PDD is checked, CTI confirmed that the figure has been updated to include all the 5 swine farms and verified as correct by site measurement with GPS device.<br>CAR 02 is closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 03 | **Section no.** | B.1 | **Date: 18/01/2023** |
| **Description of CAR** | | | | |
| The process flow of project is not accurate in figure 2 as per the actual situation of the project. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| The figure has been modified to be in line with the PDD. | | | | |

| Documentation provided by project participant | |
|---|---|
| /1/ version 02 | |
| **VVB assessment** | **Date: 01/03/2023** |
| The revised PDD is checked, CTI confirmed that the project boundary figure is updated as per the description of the project and is verified in line with the actual situation of the project.<br>CAR 03 is closed. | |

| **CAR ID** | 04 | **Section no.** | C | **Date: 18/01/2023** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the table 5 of section C, for parameter Annual average ambient temperature at project site, T, the ex ante determined temperature value is not same to PDD. Revision is requested. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| As this project is located in Sichuan Province, and the project site involve Mianyang City and Liangshan Yi Autonomous Prefecture. So, the project site temperature is sourced from Sichuan Provincial Meteorological Service and cross check with the public website. The average project site temperature sourced from Sichuan Provincial Meteorological Service are 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture during this monitoring period covering from 01/01/2022 to 31/12/2022. Meanwhile, the Sichuan Provincial Meteorological Service also provided the monthly temperature of the project site which can be cross-checked with the data of the public website. So, the actual temperature at project site in this monitoring period is higher than the ex-ante value 16-18℃.<br>The ex-ante value 16-18℃ is sourced from the official website, and the value is obtained based on years of history. The actual value for parameter Annual average ambient temperature at project site, T, during the monitoring period comes from Sichuan Provincial Meteorological Service. | | | | |
| **Documentation provided by project participant** | | | | |
| /1/ version 02 | | | | |
| **VVB assessment** | | | | **Date: 01/03/2023** |
| The revised MR is checked, CTI confirmed that the mistake has been corrected.<br>For this monitoring period, the monthly average temperature from 01/01/2022 to 31/12/2022 is 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture. While the annual average ambient temperature applied in PDD from public website is 16-18℃, which is obtained based on years of history, so the actual temperature at project site in this monitoring period is higher than the value from public website. Therefore, the value of MCF is 75% with the lower temperature of 16℃ as per Appendix 3 of ACM0010 (Version 08.0).<br>CAR 04 is closed. | | | | |

| **CAR ID** | 05 | **Section no.** | E.2 | **Date: 18/01/2023** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| The $MCF_j$ value determination is not based on the actual temperature value for this monitoring period. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| As this project is located in Sichuan Province, and the project site involve Mianyang City and Liangshan Yi Autonomous Prefecture. So, the project site temperature is sourced from Sichuan Provincial Meteorological Service and cross check with the public website. The average project site temperature sourced from Sichuan Provincial Meteorological Service are 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture during this monitoring period covering from 01/01/2022 to 31/12/2022. Meanwhile, the Sichuan Provincial Meteorological Service also provided the monthly temperature of the project site which can be cross-checked with the data of the public website. So, the actual temperature at project site in this monitoring period is higher than the ex-ante value 16-18℃. Therefore, the value of MCF is 75% with the lower temperature of 16℃ as per Appendix 3 of ACM0010(Version 08.0). Then multiplying MCF values with a value of 0.94, so 70.50% of MCFj is still used for calculation during in this monitoring period, which is consistent with the value applied in PDD. It is conservative. | | | | |
| **Documentation provided by project participant** | | | | |
| /1/ version 02 | | | | |
| **VVB assessment** | | | | **Date: 01/03/2023** |

| |
|---|
| The revised MR is checked, CTI confirmed that the value has been updated accordingly.<br>For this monitoring period, the monthly average temperature from 01/01/2022 to 31/12/2022 is 17.9℃ for Mianyang City and 17.6℃ for Liangshan Yi Autonomous Prefecture. While the annual average ambient temperature applied in PDD from public website is 16-18℃, which is obtained based on years of history, so the actual temperature at project site in this monitoring period is higher than the value from public website. Therefore, the value of MCF is 75% with the lower temperature of 16℃ as per Appendix 3 of ACM0010 (Version 08.0).<br>CAR 05 is closed. |

| **CAR ID** | 06 | **Section no.** | G.1 | **Date: 18/01/2023** |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| The location where grievance book was put is not consistent with PDD. Revision is requested. | | | | |
| **Project participant response** | | | | **Date:** 15/02/2023 |
| The section G.1 has been modified to consistent with the section E.2 of PDD and section D of SCR:<br>A grievance book was put in Administration Office of the project owner. The contact information is listed on the first page of the book. On each page that follows there is one table, incl. Date, Comment, Action requested from PP, Response from PP, Person designated with responsibility by PP. All stakeholders have access to provide feedback on this project on this book kept by Administration Office of the project owner. Stakeholders are allowed to make anonymous comments should they wish. The project owner will assign one specific person to check the comments in the book daily, record responses, and ensure the safety of the book as well. | | | | |
| **Documentation provided by project participant** | | | | |
| /1/ version 02<br>/13/ | | | | |
| **VVB assessment** | | | | **Date: 01/03/2023** |
| The revised MR is checked, CTI confirmed that the information of location has been updated and consistent with PDD. As confirmed through the onsite visit and interview with the local stakeholders, CTI verified that the inputs/grievances mechanism has been in place, Grievance Book put in the reception office in each farm.<br>CAR 06 is closed. | | | | |

**Table 4. FAR from this verification**

| **FAR ID** | N/A | **Section No.** | | **Date:** DD/MM/YYYY |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| No FAR from this verification | | | | |
| **Project participant response** | | | | **Date:** DD/MM/YYYY |
| | | | | |
| **Documentation provided by project participant** | | | | |
| | | | | |
| **VVB assessment** | | | | **Date:** DD/MM/YYYY |
| | | | | |