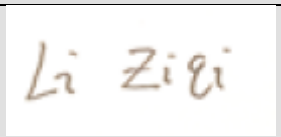
Gold Standard

**Verification report form for GS project activities**

| VERIFICATION REPORT | |
|---|---|
| **Title of the project activity** | Yuqing Rural Methane Digesters Project in Guizhou Province |
| **Reference number of the project activity** | GS ID: 2644 |
| **Version number of the Verification report** | 01.3 |
| **Completion date of the Verification report** | 11/12/2021 |
| **Monitoring period number and duration of this monitoring period** | 2nd Monitoring Period<br>01/01/2017-31/12/2019 (Including both days) |
| **Version number of monitoring report to which this report applies** | 4.0 |
| **Crediting period of the project activity corresponding to this monitoring period** | Fixed crediting period<br>28/05/2013 to 27/05/2023 (Including both days) |
| **Project participant(s)** | Guizhou Honor Carbon Asset Management Co., Ltd. |
| **Host Party** | People's Republic of China |
| **Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)** | Scope 1: Energy industries(renewable-/non-renewable sources)<br>Scope 13: Waste handling and disposal[1] /35/<br>CDM Methodology:<br>AMS-I.C. (Version 19.0): "Thermal energy production with or without electricity"<br>AMS-III.R. (Version 03.0): "Methane recovery in agricultural activities at household/small farm level"<br>Standardized baseline(s): N/A |
| **Estimated GHG emission reductions or net anthropogenic GHG removals for this monitoring period in the latest approved PDD** | 150,207 $tCO_2e$ |

[1] In the appoved PDD (version 02 dated 29/12/2014), the scopes related to the project are scope 1 and scope 15, but based on the latest EB standard Applicability of sectoral scopes (version 01.0), for methodology AMS-I.C, if electricity and/or heat is generated using biogas, then sectoral scope 1 and 13 apply and AMS-III.R. also related to scope 1 and 13. Thus, in this report, the scope 13 instead 15 to in line with the latest EB standard Applicability of sectoral scopes (version 01.0).

| | |
|---|---|
| **Certified GHG emission reductions or net anthropogenic GHG removals for this monitoring period** | 136,582 $tCO_2e$ |
| **Name of VVB** | Shenzhen CTI International Certification Co., Ltd (CTI) |
| **Name, position and signature of the approver of the Verification report** |  <br>Li Ziqi<br>Technical Reviewer/Approver |

## SECTION A. Executive summary

CTI carry out the Gold Standard (GS) 2nd periodic verification of the project "Yuqing Rural Methane Digesters Project in Guizhou Province" with regard to the relevant Gold Standard version 2.2 requirements. The verifiers have reviewed the implementation of the monitoring plan (MP) in the registered Gold Standard project. GHG data as well as sustainability aspects for the monitoring period were verified in detailed manner applying the set of requirements, audit practices and principles as required under the Gold Standard requirements.

The purpose of the project activity is to provide access to clean and affordable energy to the rural households in China. This project activity involves the installation of 18,551 Rural Methane Digesters (RMD) that will collect swine manure and other wastes, store the produced $CH_4$ so that to avoid the $CH_4$ generation and utilize the $CH_4$ for cooking purposes to reduce emissions from coal consumption. Each RMD has $8m^3$ capacity and an annual production of around $385m^3$ of biogas.

As part of the site visit and document check the Verification Team was able to confirm that the project implementation is in accordance with the project description contained in the latest approved PDD.

The project was registered as a GS-VER project with the registration number GS2644. According to the validation report/7/ and previous verification report/9/, the project participant has adopted for the fixed crediting period of 10 years, with the start date of 28/05/2013.

The estimated emission reduction from the project is 50,069 $tCO_2e$ per year during the fixed 10-year crediting period and the Certified emissions reduction for the current monitoring period from 01/01/2017 to 31/12/2019 is 136,582 $tCO_2e$/4/.

### Scope of Verification

The objective of the verification is the review and ex-post determination by an independent entity of the GHG emission reductions and the contribution to sustainable development. It includes the verification of the:

- implementation and operation of the project activity as given in the PDD/5/ and GS Passport/6/,
- compliance of the actual monitoring system and procedures with the provisions of the monitoring plan as a part of latest approved PDD, the GS monitoring matrix and the applied approved monitoring methodology,
- data given in the monitoring report by checking the monitoring records, the emissions reduction calculation and supporting evidence,
- accuracy of the monitoring equipment,
- quality of evidence,
- significance of reporting risks and risks of material misstatements.

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 GS, 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 requested in the Gold Standard version 2.2,

a) Desk review of the GS MR (version 1.0 dated 30/07/2020)/1/ and the relevant documents including draft ER calculation sheet/3/

b) On-site assessment (11/08/2020 - 14/08/2020)
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 "Yuqing Rural Methane Digesters Project in Guizhou Province" having GS Ref. Number GS2644 for the monitoring period 01/01/2017 to 31/12/2019. The verified emission reductions amount to 136,582 $tCO_2e$ in the 2nd monitoring period.

The technical parameters of the digesters are consistent with the registered PDD

In CTI's opinion, the GHG emission reductions reported for the project in the 2nd monitoring report are fairly stated. It is confirmed that emission reduction were calculated correctly on the basis of the approved monitoring methodologies AMS-I.C. ver. 19.0/30/ and AMS-III.R. ver. 03.0/31/, the monitoring plan contained in the PDD/5/ and SD monitoring plan in the GS Passport/6/.

CTI confirms that emission reduction are calculated without material misstatements. Based on the evidence and information that are considered necessary to guarantee that emission reduction are appropriately calculated, CTI is able to certify that emission reduction from the project "Yuqing Rural Methane Digesters Project in Guizhou Province" during the indicated monitoring period.

## 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 DOE or outsourced entity) | Involvement in | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Desk review | On-site inspection | Interview(s) | Verification findings |
| 1. | Team Leader & Verifier / Local Expert | IR | Du | Wenjun | CTI | √ | √ | √ | √ |

### B.2. Technical reviewer and approver of the Verification report

| No. | Role | Type of resource | Last name | First name | Affiliation (e.g. name of central or other office of DOE or outsourced entity) |
|---|---|---|---|---|---|
| 1. | Technical reviewer | IR | Li | Ziqi | CTI |
| 2. | Approver | IR | Zhou | Lu | CTI |

## SECTION C. Means of verification

### C.1. Desk review

During the desk review all documents initially provided by the client and publicly available documents relevant for the verification were reviewed. The main documents are listed below:

- the latest approved PDD including the monitoring plan/5/,
- the latest approved GS Passport/6/,
- the latest approved GS validation report/7/,
- documentation of previous verification/9/,
- the draft monitoring report, including the claimed emission reductions for the project during this monitoring period/1/,
- the draft emission reduction calculation spreadsheet for this monitoring period/3/.

Other supporting documents, such as publicly available information on the Gold Standard website and background information were also reviewed.

### C.2. On-site inspection

| **Duration of on-site inspection:** 11/08/2020 - 14/08/2020 | | | | |
|---|---|---|---|---|
| **No.** | **Activity performed on-site** | **Site location** | **Date** | **Team member** |
| 1. | Opening meeting<br>➢ Round of introduction<br>➢ Scope of Audit<br>➢ Introduction of Verification Process<br>➢ confirming focus area for the audit<br>➢ Final confirmation of audit plan<br>➢ Attendance Register | Yuqing County, Zunyi City, Guizhou Province, China | 11/08/2020 | Wenjun Du |
| 2. | Interview with PP and representative<br>➢ Information of project implementation<br>➢ The local development of this industry and relevant policy<br>➢ Technology utilized, Technical equipment and operation<br>➢ Starting date of project and crediting period<br>➢ Management Procedure and Method taken by PP<br>➢ Involved personnel and responsibilities<br>➢ Emission reduction Monitoring Plan and implementation of project taken by PP for this monitoring period<br>➢ Sampling Plan and implementation of project taken by PP for this monitoring period<br>➢ Training and detailed procedures<br>➢ Monitoring Data collection and archive procedure and method<br>➢ Environmental aspects | Yuqing County, Zunyi City, Guizhou Province, China | 11/08/2020 | Wenjun Du |
| 3. | On-site inspection | 10 towns of Yuqing County, Zunyi City, Guizhou Province, China | 11/08/2020-14/08/2020 | Wenjun Du |

| | | | | |
|---|---|---|---|---|
| | ➢ Visit randomly selected Households (HHs) to conduct physical inspection to the biogas digesters in order to verify the monitoring information presented in the monitoring report<br>➢ Verify whether the project implementation is in line with the description in the registered PDD<br>➢ Interview with HHs, getting relevant information by filling questionnaires to compare with the monitoring data in monitoring report | | | |
| 4. | Documents check<br>(As provided in the Appendix 3) | Yuqing County, Zunyi City, Guizhou Province, China | 14/08/2020 | Wenjun Du |
| 5. | Finding Summary | Yuqing County, Zunyi City, Guizhou Province, China | 14/08/2020 | Wenjun Du |
| 6. | Close Meeting<br>➢ Presenting audit findings<br>➢ Introduce following procedures after site visit | Yuqing County, Zunyi City, Guizhou Province, China | 14/08/2020 | Wenjun Du |

## C.3. Interviews

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| 1. | Hu | Zhijin | Rural Energy Office of Yuqing County | 11/08/2020 | - General aspects of the project<br>- Changes since validation / previous verifications<br>- Project implementation status<br>- Quality management system<br>- Involved personnel and responsibilities<br>- Training and practice of the monitoring personnel<br>- Implementation of the monitoring plan<br>- Monitoring data management<br>- Data uncertainty and residual risks<br>- Procedural aspects of the verification<br>- Maintenance<br>- Environmental aspects | Wenjun Du |
| 2. | Zhao | Yun | Rural Energy Office of Yuqing County | 11/08/2020 | | |
| 3. | Wu | Feng | Yuqing Agriculture Bureau | 11/08/2020 | | |
| 4. | Zhong | Zhaoyin | Youli Village/Biodigester users | 11/08/2020 | - name of household<br>- digester ID<br>- location<br>- operation status of biogas digester<br>- operation days and stop | Wenjun Du |
| 5. | Ding | Lianjiang | Erlong Village/Biodigester users | 11/08/2020 | | |
| 6. | Li | Shunxian | Zhongle | 11/08/2020 | | |

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| | | | Village/Biodigester users | | days of each biogas digester<br>- Number of days pig is alive in the farm<br>- number of pigs produced in each household<br>- number of operational digesters of the project activity<br>- sludge application<br>- average operating hours of the biogas stove for household<br>- annual operation hours of biogas digester | |
| 7. | Chen | Xihua | Youli Village/Biodigester users | 11/08/2020 | | |
| 8. | Wang | Liangyou | Shadui Village/Biodigester users | 11/08/2020 | | |
| 9. | Xie | Min | Shizi Village/Biodigester users | 11/08/2020 | | |
| 10. | Hu | Zezhi | Shengli Village/Biodigester users | 11/08/2020 | | |
| 11. | Yang | Shili | Guangming Village/Biodigester users | 11/08/2020 | | |
| 12. | Pan | Daijun | Xianfeng Village/Biodigester users | 11/08/2020 | | |
| 13. | Ge | Mingqi | Xinping Village/Biodigester users | 11/08/2020 | | |
| 14. | Yu | Dejiu | Xinping Village/Biodigester users | 11/08/2020 | | |
| 15. | He | Guanghai | Xinchang Village/Biodigester users | 11/08/2020 | | |
| 16. | Li | Fenggang | Suyang Village/Biodigester users | 11/08/2020 | | |
| 17. | Liu | Qiaowen | Suyang Village/Biodigester users | 11/08/2020 | | |
| 18. | Huang | Xingyuan | Muyeding Village/Biodigester users | 11/08/2020 | | |
| 19. | Yuan | Xiangyou | Kuilong Village/Biodigester users | 11/08/2020 | | |
| 20. | Geng | Shuli | Shaoxi Village/Biodigester users | 11/08/2020 | | |
| 21. | Tian | Hongguo | Shaoxi Village/Biodigester users | 11/08/2020 | | |
| 22. | Wang | Yajun | Shaoxi Village/Biodigester users | 11/08/2020 | | |
| 23. | Gong | Luzhang | Wengjiao Village/Biodigester users | 11/08/2020 | | |
| 24. | Shi | Jianlin | Taiping Village/Biodigester users | 11/08/2020 | | |

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| 25. | Zeng | Sixiao | Yongxing Village/Biodigester users | 11/08/2020 | | |
| 26. | Xie | Change | Manxi Village/Biodigester users | 11/08/2020 | | |
| 27. | Peng | Liangfeng | Huilong Village/Biodigester users | 11/08/2020 | | |
| 28. | Ren | Rugang | Huilong Village/Biodigester users | 11/08/2020 | | |
| 29. | Zhu | Degang | Dasong Village/Biodigester users | 12/08/2020 | | |
| 30. | Yang | Yonglin | Dasong Village/Biodigester users | 12/08/2020 | | |
| 31. | Yi | Zhixiang | Gaolu Village/Biodigester users | 12/08/2020 | | |
| 32. | Xiao | Qiyu | Shadui Village/Biodigester users | 12/08/2020 | | |
| 33. | Wang | Xingjiang | Guancang Village/Biodigester users | 12/08/2020 | | |
| 34. | Zhang | Xuehong | Shizi Village/Biodigester users | 12/08/2020 | | |
| 35. | Deng | Pinggang | Shizi Village/Biodigester users | 12/08/2020 | | |
| 36. | He | Chaohai | Guanghui Village/Biodigester users | 12/08/2020 | | |
| 37. | Zheng | Ze | Xinchang Village/Biodigester users | 12/08/2020 | | |
| 38. | Zhu | Yong | Xinchang Village/Biodigester users | 12/08/2020 | | |
| 39. | Zheng | Zhoulin | Muyeding Village/Biodigester users | 12/08/2020 | | |
| 40. | Han | Jiping | Xiaohe Village/Biodigester users | 12/08/2020 | | |
| 41. | Hou | Yonglin | Muyeding Village/Biodigester users | 12/08/2020 | | |
| 42. | Xie | Changzhi | Shaoxi Village/Biodigester users | 12/08/2020 | | |
| 43. | Li | Zhijun | Chunjing Village/Biodigester | 12/08/2020 | | |

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| | | | users | | | |
| 44. | Wang | Zuxian | Chunjing Village/Biodigester users | 12/08/2020 | | |
| 45. | Ma | Fuhua | Yongxing Village/Biodigester users | 12/08/2020 | | |
| 46. | Xiang | Changguo | Goupitan Village/Biodigester users | 12/08/2020 | | |
| 47. | Tang | Faming | Goupitan Village/Biodigester users | 12/08/2020 | | |
| 48. | Liu | Keqiang | Tianshengqiao Village/Biodigester users | 12/08/2020 | | |
| 49. | Li | Qianming | Mingxing Village/Biodigester users | 12/08/2020 | | |
| 50. | He | Qihui | Huilong Village/Biodigester users | 12/08/2020 | | |
| 51. | Qian | Shixiang | Huilong Village/Biodigester users | 12/08/2020 | | |
| 52. | Wang | Jiaqiong | Huilong Village/Biodigester users | 12/08/2020 | | |
| 53. | Gong | Wenbin | Huilong Village/Biodigester users | 12/08/2020 | | |
| 54. | Zhou | WenXiang | Erlong Village/Biodigester users | 13/08/2020 | | |
| 55. | Li | Xingcheng | Youli Village/Biodigester users | 13/08/2020 | | |
| 56. | Wan | Zuming | Dasong Village/Biodigester users | 13/08/2020 | | |
| 57. | Zhang | Zhemei | Guanxing Village/Biodigester users | 13/08/2020 | | |
| 58. | Chen | Tiancai | Guanxing Village/Biodigester users | 13/08/2020 | | |
| 59. | An | Yongchang | Guancang Village/Biodigester users | 13/08/2020 | | |
| 60. | Jiang | Daigui | Bailin Village/Biodigester users | 13/08/2020 | | |
| 61. | Gu | Guofa | Guangming Village/Biodigester users | 13/08/2020 | | |
| 62. | Ge | Guangxiong | Xinping | 13/08/2020 | | |

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| | | | Village/Biodigester users | | | |
| 63. | Wan | Kaiming | Xianfeng Village/Biodigester users | 13/08/2020 | | |
| 64. | Wu | Wanqian | Malong Village/Biodigester users | 13/08/2020 | | |
| 65. | Zhao | Chuanhui | Xinchang Village/Biodigester users | 13/08/2020 | | |
| 66. | Gu | Jineng | Zhizhou Village/Biodigester users | 13/08/2020 | | |
| 67. | Huang | Shaojie | Xiaohe Village/Biodigester users | 13/08/2020 | | |
| 68. | Jiang | Junyong | Muyeding Village/Biodigester users | 13/08/2020 | | |
| 69. | Fei | Xirong | Kuilong Village/Biodigester users | 13/08/2020 | | |
| 70. | Xiong | Guanghui | Kuilong Village/Biodigester users | 13/08/2020 | | |
| 71. | Yue | Yongbin | Shaoxi Village/Biodigester users | 13/08/2020 | | |
| 72. | Liu | Zhengyu | Shaoxi Village/Biodigester users | 13/08/2020 | | |
| 73. | Zheng | Dejiang | Tianshengqiao Village/Biodigester users | 13/08/2020 | | |
| 74. | Zhang | Peihong | Tianshengqiao Village/Biodigester users | 13/08/2020 | | |
| 75. | Liang | Yunlong | Taipinggaopo Village/Biodigester users | 13/08/2020 | | |
| 76. | Luo | Shiduan | Manxi Village/Biodigester users | 13/08/2020 | | |
| 77. | Wang | Zhihua | Huilong Village/Biodigester users | 13/08/2020 | | |
| 78. | Wu | Shijie | Huilong Village/Biodigester users | 13/08/2020 | | |
| 79. | Ma | Pingde | Songyan Town/Technician | 14/08/2020 | - Monitoring data survey<br>- Monitoring data collection<br>- Monitoring data record<br>- Monitoring data verify<br>- Monitoring data check | Wenjun Du |
| 80. | Chen | Hong | Songyan Town/Technician | 14/08/2020 | | |
| 81. | Gou | Yuanhua | Guanxing Town/Technician | 14/08/2020 | | |

| No. | Interviewee | | | Date | Subject | Team member |
|---|---|---|---|---|---|---|
| | Last name | First name | Affiliation | | | |
| 82. | Li | Xiaoping | Guanxing Town/Technician | 14/08/2020 | - - Monitoring data management | |
| 83. | Wu | Jiajie | Aoxi Town/Technician | 14/08/2020 | | |
| 84. | Yang | Changquan | Aoxi Town/Technician | 14/08/2020 | | |
| 85. | Zhong | Shouchang | Longjia Town/Technician | 14/08/2020 | | |
| 86. | Deng | Chengchun | Longkjia Town/Technician | 14/08/2020 | | |
| 87. | Liu | Jiaxiang | Dawujiang Town/Technician | 14/08/2020 | | |
| 88. | Ma | Pingde | Dawujiang Town/Technician | 14/08/2020 | | |
| 89. | Zhao | Xingcai | Longxi Town/Technician | 14/08/2020 | | |
| 90. | Zhu | Youguo | Longxi Town/Technician | 14/08/2020 | | |
| 91. | Qian | Bing | Xiaosai Town/Technician | 14/08/2020 | | |
| 92. | Zhou | Anfang | Xiaosai Town/Technician | 14/08/2020 | | |
| 93. | Luo | Wu | Goupitan Town/Technician | 14/08/2020 | | |
| 94. | Deng | Wenfeng | Goupitan Town/Technician | 14/08/2020 | | |
| 95. | Yang | Jian | Baini Town/Technician | 14/08/2020 | | |
| 96. | Tian | Yongxin | Baini Town/Technician | 14/08/2020 | | |
| 97. | Ni | Jun | Huashan Town/Technician | 14/08/2020 | | |
| 98. | Zhang | Chun | Huashan Town/Technician | 14/08/2020 | | |

| Last name | First name | Household ID |
|---|---|---|
| Zhong | Zhaoyin | YQ-200933552 |
| Ding | Lianjiang | YQ-200932661 |
| Li | Shunxian | YQ-200933267 |
| Chen | Xihua | YQ-200933957 |
| Wang | Liangyou | YQ-200935926 |
| Xie | Min | YQ-200935545 |
| Hu | Zezhi | YQ-200938243 |
| Yang | Shili | YQ-200937916 |
| Pan | Daijun | YQ-200938580 |
| Ge | Mingqi | YQ-200938180 |
| Yu | Dejiu | YQ-200940032 |
| He | Guanghai | YQ-200941283 |
| Li | Fenggang | YQ-200941881 |
| Liu | Qiaowen | YQ-200941987 |
| Huang | Xingyuan | YQ-200943174 |
| Yuan | Xiangyou | YQ-200943273 |
| Geng | Shuli | YQ-200942768 |
| Tian | Hongguo | YQ-200943083 |
| Wang | Yajun | YQ-200945796 |

| | | |
|---|---|---|
| Gong | Luzhang | YQ-200945705 |
| Shi | Jianlin | YQ-200945444 |
| Zeng | Sixiao | YQ-200948301 |
| Xie | Change | YQ-200949070 |
| Peng | Liangfeng | YQ-200949260 |
| Ren | Rugang | YQ-200933552 |
| Zhu | Degang | YQ-200933124 |
| Yang | Yonglin | YQ-200933611 |
| Yi | Zhixiang | YQ-200934914 |
| Xiao | Qiyu | YQ-200934147 |
| Wang | Xingjiang | YQ-200935816 |
| Zhang | Xuehong | YQ-200936010 |
| Deng | Pinggang | YQ-200936100 |
| He | Chaohai | YQ-200937689 |
| Zheng | Ze | YQ-200939949 |
| Zhu | Yong | YQ-200940323 |
| Zheng | Zhoulin | YQ-200942021 |
| Han | Jiping | YQ-200941171 |
| Hou | Yonglin | YQ-200941481 |
| Xie | Changzhi | YQ-200942767 |
| Li | Zhijun | YQ-200943074 |
| Wang | Zuxian | YQ-200943420 |
| Ma | Fuhua | YQ-200946234 |
| Xiang | Changguo | YQ-200945310 |
| Tang | Faming | YQ-200945958 |
| Liu | Keqiang | YQ-200945145 |
| Li | Qianming | YQ-200947961 |
| He | Qihui | YQ-200949255 |
| Qian | Shixiang | YQ-200948856 |
| Wang | Jiaqiong | YQ-200949332 |
| Gong | Wenbin | YQ-200948864 |
| Zhou | WenXiang | YQ-200932524 |
| Li | Xingcheng | YQ-200932773 |
| Wan | Zuming | YQ-200933095 |
| Zhang | Zhemei | YQ-200934601 |
| Chen | Tiancai | YQ-200934621 |
| An | Yongchang | YQ-200935686 |
| Jiang | Daigui | YQ-200935411 |
| Gu | Guofa | YQ-200938224 |
| Ge | Guangxiong | YQ-200938584 |
| Wan | Kaiming | YQ-200938334 |
| Wu | Wanqian | YQ-200940012 |
| Zhao | Chuanhui | YQ-200940027 |
| Gu | Jineng | YQ-200941935 |
| Huang | Shaojie | YQ-200941861 |
| Jiang | Junyong | YQ-200941599 |
| Fei | Xirong | YQ-200942499 |
| Xiong | Guanghui | YQ-200943055 |
| Yue | Yongbin | YQ-200942887 |
| Liu | Zhengyu | YQ-200942828 |
| Zheng | Dejiang | YQ-200945932 |
| Zhang | Peihong | YQ-200945209 |
| Liang | Yunlong | YQ-200945337 |
| Luo | Shiduan | YQ-200948168 |
| Wang | Zhihua | YQ-200949123 |
| Wu | Shijie | YQ-200949244 |

## C.4. Sampling approach

C.4.1 Sampling during monitoring

| | |
|---|---|
| ☐ | No sampling approach has been used by the PP to determine the monitored parameters |
| ☒ | A sampling approach has been taken for the following monitored parameter(s): |

| Parameter | Sampling approach[1)] | Sampling Type[2)] | Population | Sample Size |
|---|---|---|---|---|
| $N_{da,y}$[2] | CS and SiRS | PS | 18,551 | 328 (yearly) |
| $N_{p,y}$[3] | CS and SiRS | PS | 18,551 | 328 (yearly) |
| $N_d$ | CS and SiRS | PS | 18,551 | 328 (yearly) |
| $H_{stove}$ | CS and SiRS | PS | 18,551 | 328 (yearly) |
| $H_{digester}$ | CS and SiRS | PS | 18,551 | 328 (yearly) |
| *Application of sludge* | CS and SiRS | PS | 18,551 | 328 (yearly) |

[1)] *Sampling Approaches:*

*SiRS:* *Simple Random Sampling*
*StRS:* *Stratified Random Sampling*
*SS:* *Systematic Sampling*
*CS:* *Cluster Sampling*
*MSS:* *Multi-stage Sampling*

[2)] *Sampling Types:*

*PS:* *Parameter Sampling*

### *Sampling design*

In this monitoring period (01/01/2017-31/12/2019), there are 18,551 households with RMD in this PA via checking the MR against the PDD/5/. All the households are located in Guizhou province, which is a limited area. Simple random sampling approach was selected for this PA due to relatively homogenous population being studied, given the similar average ambient temperature and similar living habit of residents in Guizhou. Therefore, Cluster Sampling(CS) and simple random sampling (SRS) approach was followed by the PP to determine the sample size and samples location, and it is able to confirm the selection of sampling approach is appropriate as per verification team's local knowledge. Target population is defined as all the households included in the PA, i.e. 18,551 households.

As per the applied methodologies and PDD/5/, a single sample was drawn by the PP from the monitoring database in line with the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities (hereafter can be referred to as the 'sampling guideline'). According to the applied methodologies, confidence/precision of 90/10 is acceptable for sampling. For this PA, confidence/precision is determined as 90/10. Therefore, it is able to confirm that the selection of confidence/precision is appropriate by verification team.

According to the methodologies applied and approved PDD/5/, sampling approach is applied for the monitoring parameters as above table,

[2] This parameter is not listed in the PDD but it is used to calculate the parameter of $N_{LT,y}$ based on formular $N_{LT,y} = N_{da,y} * (N_{p,y} / 365)$

[3] This parameter is not listed in the PDD but it is used to calculate the parameter of $N_{LT,y}$ based on formular $N_{LT,y} = N_{da,y} * (N_{p,y} / 365)$

The sample size of the PA considering the parameters is calculated in a conservative way, and the least number of the sample size is 328 for two different methodology combinations. The PP chose 328 samples during this monitoring period as the same requested in the PDD. Details for identify the sample size can be referred below.

***Sample Method***

Because the biogas digester of peasant households is numerous and scattered, the type and utilized technology of methane tanks are identical, stratified random sampling is adopted in order that each one can be selected with equal probability. The strata should be mutually exclusive: every element in the population must be assigned to only one stratum. The sample is drawn at random from the sampling frame. This can be done using random number tables, and the ordering of subjects on the sample should be random and free of any trend or cyclical pattern.

***Desired Precision/Expected Variance and Sample Size***

Step1: As per Elementary Statistics: a brief version, Allan G. Bluman, published by McGraw-Hill Higher Education

$$n_1 = \frac{Z^2\sigma^2}{d^2}$$

Where:

Z: the symbol used in general formula for confidence intervals. It is 1.645 when confidence interval is 90%;

σ:the population standard deviation, which is not available to PP.

d: the maximum error of estimate.

Step2: Deformation of basic formula

As per Sample Size Determination in Marketing Research, XIANG Caifa from Shanghai Statistics Information and Consulting Service Center published on Shanghai Statistics

$$n_1 = \frac{Z^2\sigma^2}{d^2} = \frac{Z^2\left(\sigma^2 / X^2\right)}{d^2 / X^2} = Z^2V^2 / e^2$$

Where:

V, the coefficient of variation, and V=σ/X. As population standard deviationσshall be smaller than the sample mean value X, hence from conservative consideration point of view, making V=1 can get the biggest sample size. It is conservative.

e: the relative sampling error, and e=d/X, which is the precision. In this case, e=10% as discussed above.

Consequently, $n_1=Z^2V^2/e^2 =1.645^2/0.1^2=270.6$, and round up to be 271.

Step3: Correction based on population size

As per Sampling Theory and Methodology, published by China Statistics Press

$$n_2 = \frac{n_1 N}{n_1 + N}$$

Where:

N, the population size, it is 18,551 under project context.

Consequently

$n_2=n_1*N/(n_1+N)=271*18,551/(271+18,551)= 267.09$, and round up to be 268, it take $n_2=268$ is preferable.

Step4: Correction based on sampling approach

As per Sampling Design and Methodology, written by SHEN Hao from Survey & Statistics Institute of BBI

$$n_3 = Bn_2$$

Where:

B, the survey design effect. As discussed in Procedures for Administering Data Collection and Minimizing

Non-Sampling Errors. The project adopts stratified random sampling approach.

In this case, B≤1 as per Sampling Design and Methodology. It's conservative consideration.

Consequently, $n_3=B*n_2=1*n_2=268$

Step5: Correction based on responding rate

As per Sampling Design and Methodology, written by SHEN Hao from Survey & Statistics Institute of BBI

$$n_4 = \frac{n_3}{r}$$

Where:

The responding rate is adopted to be less 90% according to Rural Household Biogas Investigation report of Yuqing County.

Consequently, $n_4=n_3/r=268/90\%=297.78$, round up to be 298

Step 6: Correction based on contingency consideration

$n=110\%n_4$

Where:

Consequently, the sample size $n=110\%*n_4=110\%*298=327.8$, round up to be 328.

***Quality Assurance***

Stage 1. Calculate the ratio of household numbers of each town in the whole program. According to the ratio household numbers of each town, calculate the sampling size of each town, and then set the amount of sampling 328 households, the actual sampling size is the ratio of each town multiply by 328.

Table C-1: Sampling number of biogas system in each county

| Town | Number | Portion | Sampling size |
|---|---|---|---|
| Songyan | 2,493 | 13.44% | 44 |
| Guanxing | 1,310 | 7.06% | 23 |
| Aoxi | 2,377 | 12.81% | 42 |
| Longjia | 1,767 | 9.53% | 31 |
| Dawujiang | 1,706 | 9.20% | 30 |
| Longxi | 1,490 | 8.03% | 26 |
| Xiaosai | 2,714 | 14.63% | 48 |
| Goupitan | 2,694 | 14.52% | 48 |
| Baini | 590 | 3.18% | 11 |
| Huashan | 1,410 | 7.60% | 25 |
| **Total** | **18,551** | **100%** | **328** |

Via checking the Sample size calculation spreadsheet/10/, it is confirmed that the sample size is calculated as per the Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities and the result was recalculated by the verification team to be confirmed as correct.

A Monitoring Survey Record of the 328 samples (yearly) as listed in the ER sheet/4/ was supplied by the PP, which was compiled base on the sampling survey forms/19/ done by the technicians. In the Survey record, name of household, digester ID, location, operation status of biogas digester, operation days and stop days of each biogas digester, Number of days pig is alive in the farm, number of pigs produced in each household, number of operational digesters of the project activity, sludge application, average operating hours of the biogas stove for household, annual operation hours of biogas digester, etc. information related to this monitoring period were monitored and recorded. Via interview with the PP and technicians, it is confirmed that 328 households (yearly) are randomly selected from the 18,551 households list by the Cluster Sampling (CS) and simple random sampling (SRS) method based on the sample size determined in table C-1 for each town of Yuqing County. The excel function "randbetween" is employed to choose the households sample in each town group. The PP distributed the survey form to local Energy Offices, then the technicians of each town visited the households in the project sample group and collected data with the sampling survey forms/19/.

The verification team checked the adoption of sampling size calculation equations and parameter calculation process of the monitoring parameters that applied with sampling approach.

For the sampling process, via checking the 328 samples (yearly) against with the list of 18,551 HHs, it is verified that the 328 samples (yearly) cover 10 towns in Yuqing County and the size for each town is in line with the sample size determined in table C-1 for each town of Yuqing County.

It is able to confirm that the sampling approach was consistent with the latest GS requirements. Sampling type was properly selected, the required confidence/precision has been met, and the sampling size was corrected calculated, so that the selected samples were representative of the population.

**Acceptance of Sampling conducted by VVB**

Using own professional judgement, it is assumed that the Acceptable Quality Level (AQL) is 1% and the Unacceptable Quality Level (UQL) is 10% for this PA. The maximum error of producer's risk and consumer's risk is assumed at 5%, in compliance with the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities (hereafter referred to as the "sampling standard")/28/. Based on these assumptions, the verification team refers to the sampling standard/28/ and sampling guideline/27/ and found that sample size should be not less than 61 and acceptance number is 2.

To be more conservative, before the on-site visit, CTI determined 75 as the sample size and randomly selected 75 (25 for each year) from the PP survey list of the 328 samples (yearly). For the randomly selection of 75, a pre-randomized order of numbers ranging from 1-75 as calculated by Excel's RAND() function was brought to the field and a household list prepared in the field. If for example, the first number is 5, then the household name that was listed 5th on the household list would be the one to be surveyed.

During on-site visit, 75 households (total sample size, 25 for each year) were chosen by the verification team randomly to check the correctness of sampling size and data that need to be monitored. This is considered to be a good practice.

For the selected 75 from the survey list of the 328 samples (yearly, total is 984), CTI checked the Acceptance as below table,

| Parameter | Number of samples in MR | Number of samples by verification team | Acceptance number | Discrepant records | Acceptable or not |
|---|---|---|---|---|---|
| $N_{da,y}$ | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |
| $N_{p,y}$ | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |
| $N_d$ | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |
| $H_{stove}$ | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |
| $H_{digester}$ | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |
| *Application of sludge* | 328 (yearly) | 75 (25 yearly) | 2 | 0 | Yes |

As per the above table, it is concluded that there are no discrepancies are found for all the monitored results between PP and VVB sampling.

In all, it is observed that the number of discrepant records is less than the acceptance number. Therefore, in accordance with paragraph 28 and 32 of the sampling standard/28/, it is able to confirm that the sample size and sampling result from PP is acceptable.

To make sure the data would be well collected during on-site sampling, technicians were well trained before they start the collecting work. A copy of training material and training record/21/ were reviewed and verified by the verification team. Photos of the training courses/21/ were also supplied and it is able to confirm that the technicians were well trained before start working. When the technicians went to the households, survey forms/19/ were supplied to the households and households are required to answer the questions on the survey forms. After the survey forms were filled, both technicians and the households signed on the survey forms. After all the sampled households filled in such survey forms, the survey forms are collected by energy office, and energy offices summarizes and keep the survey forms. Then the survey record prepared by PP. The survey forms/19/ were well preserved and supplied to the verification team during on-site verification.

The verification team has checked the survey forms/19/ filled by the household users' information, summarized by PP. Furthermore, during on-site verification, the verification team has interviewed 20 technicians who conducted the sampling survey and confirmed that the survey was conducted based on the sampling plan and via checking the signatures of the technicians between the 328 survey forms (yearly)/19/ and on-site CTI form of personnel interviewed, it is confirmed that the signatures of the technicians are consistent. The verification team is able to confirm that the sampling process is reliable.

**Conclusion**

Based on the document review and on-site visit interviews, the verification team verifies that the registered monitoring plan is implemented as planned and confirms that the operational and management system is implemented as per the registered monitoring plan.

During the on-site visit the verification team was able to verify that monitoring organization structure and data collection procedure is in line with monitoring plan of the approved PDD and monitoring report. Moreover, the verification team has interviewed the 20 personnel who are working on the data collection and management and 75 household users that were randomly selected. The verification team verified certain documents, like survey forms/19/ filled by the household users' information summarized by PP. A monitoring mechanism which was established by the PP was found to be in place and working properly. Technicians were well trained/21/ before start working and a data management system were established for data management. QA/QC procedure was established to avoid misuse of invalid data.

It was verified that authorities and responsibilities for monitoring and reporting of all data related to the emission reductions were clearly defined for this monitoring period. Moreover, the biogas digesters in this PA during this monitoring period were properly installed/12/. Operation data were collected by well trained technicians/21/. The frequency of monitoring,

measurement, as well as reporting details were conducted as outlined in the monitoring plan available in the latest version of the PDD/5/.

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

| Areas of verification findings | No. of CL | No. of CAR | No. of FAR |
|---|---|---|---|
| Compliance of the monitoring report with the monitoring report form (D.1) | - | 3 | - |
| Remaining forward action requests from validation and/or previous verification (D.2) | - | - | |
| Compliance of the project implementation with the registered PDD (D.3) | – | 1 | - |
| Post-registration changes (D.4) | - | - | - |
| Compliance of the monitoring plan with the monitoring methodology including applicable tool and standardized baseline (D.5) | - | - | - |
| Compliance of monitoring activities with the registered monitoring plan (D.6) | - | 4 | - |
| Compliance with the calibration frequency requirements for measuring instruments (D.7) | - | - | - |
| Assessment of data and calculation of emission reductions or net removals (D.8) | 1 | 3 | - |
| Grievance Mechanism/Continues Inputs (D.9) | - | 1 | – |
| Others (please specify) | - | - | - |
| **Total** | **1** | **12** | **-** |

## SECTION D. Verification findings

### D.1. Compliance of the monitoring report with the monitoring report form

| | |
|---|---|
| **Means of verification** | A draft monitoring report/1/ was submitted to the verification team by the project participants prior to the start of the verification activities.<br>Every section has been checked against the respective guidance and GS requirements. |
| **Findings** | CAR 01, CAR 02, CAR 03 |
| **Conclusion** | CAR 01, CAR 02 and CAR 01 are closed. Refer to Appendix 4 for findings' resolution.<br>A draft monitoring report/1/ was submitted to the verification team by the project participants.<br>During the verification, mistakes and needs for clarification were identified. The PP has carried out the requested corrections so that it can be confirmed that the Monitoring report is complete and transparent and in accordance with the latest approved PDD and other relevant requirements.<br>Refer to the below sections for details. |

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

This is the 2nd periodic verification of the PA. There is 2 FARs from previous verifications via checking the previous verification report/9/. Please refer to the appendix 4 for details.

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

| | |
|---|---|
| **Means of verification** | According to Gold Standard version 2.2 Requirements/39/, CTI conducted an on-site inspection (11/08/2020-14/08/2020) to assess that all physical features (technology, project equipment, and monitoring procedures) of the project are in places and the PP have operated the project as per the PDD and Passport. It was found that: |

The PA aims to reduce amount of greenhouse gases (GHG) by facilitating the installation of a number of household RMD for the rural households located in Yuqing County in Guizhou province, P. R. China/5/. During this 2nd monitoring period 01/01/2017–31/12/2019/2/, 18,551 households were equipped with the RMD in 10 towns, all of which are located in Yuqing County. In this monitoring period quantities of the households are not changed.

The detailed geographic coordinates of the 10 towns included in this monitoring period is listed as below:

| Town | Longitude | Latitude |
|---|---|---|
| Songyan | 107.5085°E -107.6878°E | 27.5565°N -27.7032°N |
| Guanxing | 107.6725°E -107.8069°'E | 27.4755°N -27.6312°N |
| Aoxi | 107.5865°E -107.6852°E | 27.4556°N -27.6023°N |
| Longjia | 107.5231°E -107.5869°E | 27.4043°N -27.5722°N |
| Dawujiang | 107.5725°E -107.7885°E | 27.2828°N -27.5326°N |
| Longxi | 107.6568°E -107.8886°E | 27.2969°N -27.3828°N |
| Xiaosai | 107.6869°E -107.8778°E | 27.1878°N -27.3069°N |
| Goupitan | 107.4398°E -107.6787°E | 27.2269°N -27.3896°N |
| Baini | 107.7589°E -108.0385°E | 27.1324°N -27.2789°N |
| Huashan | 107.4388°E -107.5765°E | 27.2852°N -27.4589°N |

Prior to the project activity, every household in the project area has pigs, and their manure is responsible for $CH_4$ emissions, naturally vented into the atmosphere. In the meantime, coal was used as source of energy for cooking in daily life. This is the baseline scenario as defined in PDD/5/. Through the project activity, each household is equipped with a RMD that treats the manure anaerobically and recovers the generated methane as energy supply, which will avoid methane emission and reduce coal consumption.

During this monitoring period, the notice on the existing total household number as well as the RMD number included issued by the local government was checked/12/. In the notice, government confirmed that the number of included households for this project was 18,551. Moreover, during the on-site verification a full list of the households in end uses' database/11/ equipped with RMD were verified by verification team, on which name, digester serial No., digester location, and construction date were clearly indicated. Through checking above mentioned documents, the verification team is able to confirm that the total number of household equipped with RMD is 18,551 and the households included in are not changed, which is consistent with the monitoring report.

The verification team also checked construction time of all the digesters on the Household list/11/ that included in project and confirmed that the earliest construction date of project is 18/03/2009, which is consistent with the PDD/5/. During on-site visit, the verification team checked the RMD equipped in each sampled household. Each RMD system consists of components such as main body, gas storage space, hydraulic acidification pool, inlet port, outlet port, fertilizer room, active cover, water storage circle, stirring outlet pipe, refluxing pressure limiter and hydraulic washing pipe. Verification team is able to confirm that the systems were equipped in line with the PDD. The digesters were designed according to relevant regulations, checked and accepted by local authority/13/. Therefore, based on this on-site visit and the reviewed project documentation, the verification team confirms that the realized technology, the project equipment and household number are consistent with the description in the registered PDD.

There is no information (data and variables) provided in the monitoring report that is different from that stated in the PDD.

| | |
|---|---|
| **Findings** | CAR 04 |
| **Conclusion** | CAR 04 is closed. Refer to Appendix 4 for findings' resolution.<br>In conclusion, based on document review, and stakeholder interview, together based on verification team's local and sectoral expertise, it is confirmed that:<br>The implementation and operation of the project system included in the latest approved PDD are consistent with the actual project implementation and operation situation. |

## D.4. Post-registration changes

### D.4.1. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

N/A

### D.4.2. Corrections

N/A

### D.4.3. Changes to the start date of the crediting period

N/A

### D.4.4. Inclusion of a monitoring plan to a registered project activity

N/A

### D.4.5. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

N/A

### D.4.6. Changes to the project design of a registered project activity

N/A

### D.4.7. Types of changes specific to afforestation and reforestation project activities

| | |
|---|---|
| ☒ | N/A - as this monitoring plan was part of the latest approved PDD |

## D.5. Compliance of monitoring plan with the monitoring methodology including applicable tool and standardized baseline

| | |
|---|---|
| **Means of verification** | According to GS version 2.2 Requirements/39/, the verification team conducted verification of compliance of monitoring plan with the monitoring methodology including applicable tools.<br>During the document review and furthermore during the on-site visit, the verification team has reviewed the registered monitoring plan and compared it with the applied methodology to verify their compliance.<br>The verification team conducted the documents review including validation report, approved PDD/5/, previous verification report/9/ and their related monitoring report/8/. |

| | |
|---|---|
| | Via checking the PDD/5/, it is confirmed that the PA apply the monitoring methodology AMS-I.C. “Thermal energy production with or without electricity” (Version 19.0)/30/ and AMS-III.R. “Methane recovery in agricultural activities at household/small farm level” (version 03.0)/31/. The actual procedures followed for monitoring of parameters are checked against the parameters and procedures provided in the respective applied methodologies.<br>All parameters stated in the monitoring plan and the applied methodology has been fulfilled in the current monitoring report. All baseline/project emission parameters has been verified and found satisfactory.<br>To verify the validity of the data/parameters, the verification team checked the parameters one by one, comparing the data in MR and the inspection findings during the site-visit, the discussion regarding each parameter has been elaborated in the further sections of this report.<br>The monitoring plan as mentioned in the respective validated PDD/5/ is in accordance with the applied methodologies.<br>Implementation of sampling plan was conducted by applying 90/10 confidence/precision, according to the “Guidelines for Sampling and Surveys for CDM Project Activities and Programme of Activities”/27/. The sampling procedures are confirmed in compliance with the requirement of representative sampling methods in the applied monitoring methodology AMS-I.C. “Thermal energy production with or without electricity” (Version 19.0)/30/ and AMS-III.R. “Methane recovery in agricultural activities at household/small farm level” (version 03.0)/31/. |
| **Findings** | N/A |
| **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.<br>The monitoring system and all applied procedures of sustainable development are completely in compliance to the latest approved Passport. |

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

### D.6.1. Data and parameters that are available at validation

**Means of verification**

The documents review and the site visit revealed that a complete set of data for the specified monitoring period is available. The correctness of information provided in the monitoring report has been cross-checked against the latest approved PDD.

The following ex-ante parameters have been checked the compliance with the latest approved monitoring plan.

| Parameter | Unit | Applied Value and Assessment |
|---|---|---|
| $GWP_{CH4}$ - Global warming potential for $CH_4$ | dimensionless | In this monitoring period global warming potential for $CH_4$ is 25 $tCO_2e/tCH_4$ according to para. 66 of EB69 meeting report “the Board agreed that the second commitment period global warming potentials (GWPs) shall apply to all calculations of emissions reductions or removals achieved from 01/012013”/29/.<br>Value is 25. |
| $B_{o,LT}$ - Maximum methane producing potential of the manure type treated in the biogas | $m^3CH_4$ /kg VS excreted | The applied value derived from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories/37/, Volume 4, and Chapter 10, Table 10A-7 (swine). Conservative standard value for Asian swine is applied for all animals in |

| | | | |
|---|---|---|---|
| | | | the calculations of emission reduction of the proposed PA which has been ex ante determined in the PDD.<br>Value is 0.29. |
| | $D_{CH4}$ - Density of methane | $t/m^3$ | The applied value derived from Methodology AMS-III.D (Version 19.0) which has been ex ante determined in the PDD.<br>Value is 0.00067. |
| | $UF_b$ - Model correction factor to account for model uncertainties | - | The applied value derived from the referred methodology AMS-III.D (version 19.0) which has been ex ante determined in the PDD.<br>Value is 0.94. |
| | $MS\%_{Bl,j}$ - Fraction of manure handled in baseline animal manure management system j | % | The applied value derived from the PDD, as per the PDD, the biogas digesters were constructed under the piggery, as the pigs are kept in a confined area and do not leave the area in baseline or project scenario, therefore, it just take swine to calculate the methane emission. Value of 100% is conservative, which has been ex ante determined in the PDD.<br>Value is 100. |
| | $VS_{LT,y}$ - Volatile solids for livestock LT entering the animal manure management system in year *y* | kg dry matter/animal/day | The applied value derived from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories/37/, Volume 4, and Chapter 10, Table 10A-7 (swine), the value for the daily solid excreted by Asian swines, which has been ex ante determined in the PDD.<br>Value is 0.3. |
| | $KW_{thermal}$ -<br>The thermal capacity of the biogas stove for household | kW | The applied value derived from Test report by the third party in Feb. 2012/15/ which has been ex ante determined in the PDD.<br>Value is 2.33. |
| | DI - Thermal efficiency of the biogas stove | % | The applied value derived from Test report by the third party in Feb. 2012/15/ which has been ex ante determined in the PDD.<br>Value is 55. |
| | $\eta_{BL,\ thermal}$ -<br>Thermal efficiency for the traditional coal furnace of the baseline situation | % | The applied value derived from<br>1) Referenced literature value<br>"Clean Energy for Development and Economic Growth: Biomass and Other Renewable Energy Options to Meet Energy and Development Needs in Poor Nations", UNDP, 2002/36/<br>2) The on-site measurement data of thermal efficiency of traditional coal stoves in project case by the Local energy office/14/. |

| | | | |
|---|---|---|---|
| | | | The value from source 2) is higher than 1), so following conservative principle, 25% shall be chosen as the baseline thermal efficiency for the traditional coal stoves which has been ex ante determined in the PDD.<br>Value is 25. |
| **Findings** | N/A | | |
| **Conclusion** | The parameters fixed ex ante have been indicated in the registered GS PDD/5/. And the MR/2/ is checked as in line with the PDD/5/. | | |

### D.6.2. Data and parameters monitored

**Means of verification**

In accordance with GS version 2.2 requirement/39/, sample standard/guideline and applied methodologies included the applied tools, the verification team reviewed the MR and PDD, crosschecked against the other available data and documents, verified whether monitored parameters in accordance with all relevant applicable requirements in the GS; whether the MR list all data and parameters to be monitored, as required by the applied methodologies (AMS-I.C. and AMS-III.R.) and whether the data and parameters obtained in a reasonable way, whether the sample plan conducted accordingly, the source and the applied value of the 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.

The information flow and the values in the monitoring report were verified as follows:

| **Data/Parameter** | $N_{LT,y}$ |
|---|---|
| Description | Annual average number of pigs |
| Unit | Head |
| Value applied for this monitoring period | 4.290 (01/01/2017 – 31/12/2017)<br>4.231 (01/01/2018 – 31/12/2018)<br>3.315 (01/01/2019 – 31/12/2019) |
| 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The values are originally derived from Biogas Monitoring Forms filled by the households/16/ |
| 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? | In order to determine the annual average number of pigs, PP have followed sampling approach and randomly selected 328 |

| | | |
|---|---|---|
| | | households for interview (different samples for different year during this monitoring period).<br>The number of pigs was determined based on the monthly number of pigs per households, and the annual value is the average of monthly values.<br>At the beginning of each monitoring period, the 328 samples were selected randomly and then the Biogas Monitoring Form prepared by PP for data collection was distributed to each sample household and the sample households filled the forms with the monthly number of pigs live in the pig house.<br>The data is summarized calculate and archived monthly to determine the value of this parameter.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ were provided to the verification team.<br>Via checking these evidence, it is confirmed that annual average number of pigs is<br>4.290 (01/01/2017 – 31/12/2017)<br>4.231 (01/01/2018 – 31/12/2018)<br>3.315 (01/01/2019 – 31/12/2019)<br>Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered and calculated by verification team, it is confirmed that annual average number of pigs is calculated as same to the MR values, thus it is confirmed that the values in MR is reasonable and correct.<br>Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The value is derived from sampling survey records/4/ and cross checked by the original forms filled by farmers for record number of pigs monthly in the monitoring period/16/. |
| | Does the data management ensure correct transfer of data and reporting of | Yes, QA/QC procedures were found to be appropriate and reliable. |

| | |
|---|---|
| emission reductions and are necessary QA/QC processes in place? | Well trained Technicians train and guide the farmers how to record, then technicians took on-site inspection monthly to confirm the actual situation and crosscheck the results, this has been confiremd by interview with farmers and technicians. This has been verified by checking the signatures of technicians recorded in Biogas Monitoring Forms filled by the households/16/. |

| **Data/Parameter** | $H_{digester}$ |
|---|---|
| Description | Annual operation hours of biogas digester |
| Unit | hour |
| Value applied for this monitoring period | 8,752.945 (01/01/2017 - 31/12/2017)<br>8,753.079 (01/01/2018 - 31/12/2018)<br>8,753.141 (01/01/2019 - 31/12/2019) |
| 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The values are originally derived from Biogas Monitoring Forms filled by the households/16/ |
| 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? | In order to determine the annual operation hours of biogas digester, PP have followed sampling approach and randomly selected 328 households for interview (different samples for different year during this monitoring period).<br>The operation hours of biogas digester was determined based on the record of the date of stopping operation and the date of re-operation when the biogas digester is out of service, which is summarized once a year.<br>At the beginning of each monitoring period, the 328 samples were selected randomly and then the Biogas Monitoring Form prepared by PP for data collection was distributed to each sample household and the sample households filled the forms with the date of stopping operation and the date of re-operation when the biogas digester is out of service. |

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|---|---|
| | The data is summarized yearly to determine the values of this parameter.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ were provided to the verification team.<br>Via checking these evidence, it is confirmed that annual operation hours of biogas digester is<br>8,752.945 (01/01/2017 - 31/12/2017)<br>8,753.079 (01/01/2018 - 31/12/2018)<br>8,753.141 (01/01/2019 - 31/12/2019)<br>Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered and calculated by verification team, it is confirmed that annual operation hours of biogas digester is calculated as same to the MR values, thus it is confirmed that the values in MR is reasonable and correct.<br>Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The value is derived from sampling survey records/4/ and cross checked by the original forms filled by farmers for record number of pigs monthly in the monitoring period/16/. |
| 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>Well trained Technicians train and guide the farmers how to record, then technicians personally check and sign for confirmation, and make statistics every year. At the same time, the technicians would check the use and monitoring of farmers from time to time and give guidance. This has been verified by checking the signatures of technicians recorded in Biogas Monitoring Forms filled by the households/16/. |

| **Data/Parameter** | $N_d$ |
|---|---|
| Description | The annual number of biogas systems including the digesters and biogas stoves engaged in the proposed project |

| | |
|---|---|
| Unit | unit |
| Value applied for this monitoring period | 18,529 (01/01/2017 - 31/12/2017)<br>18,534 (01/01/2018 - 31/12/2018)<br>16,417 (01/01/2019 - 31/12/2019) |
| 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from yearly record issued by local energy office/17/ and cross checked by the original record data sheet/18/ filled by technicians for record the information of biogas digesters that are in normal operation in the monitoring period. |
| 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? | $N_d$ (Annual number of biogas systems including the digesters and biogas stoves engaged in the project) is monitored by technicians and final yearly value is verified by local energy office statistically.<br>Via checking the biodigester users' database/11/ which record the relevant information about the user of biogas digesters (such as the name, location and serial number of the householder), it is verified that the number of biogas systems including the digesters and biogas stoves engaged in the project is 18,551 which is same to the ex ante determined in the PDD/5/. But this number is just the total number of digesters and biogas stoves involved in the project boundary, in order to check if all the digesters and biogas stoves were used normally in this monitoring period, the technicians have conducted the monitoring as per the request in the PDD.<br>Via interview with technicians and checking the original record data sheet/18/ filled by technicians for record the information of biogas digesters that are not in normal operation in the monitoring period, following data was confirmed:<br>18,529 (01/01/2017 - 31/12/2017)<br>18,534 (01/01/2018 - 31/12/2018)<br>16,417 (01/01/2019 - 31/12/2019) |

| | |
|---|---|
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The value is derived from yearly record issued by local energy office/17/ and cross checked by the original record data sheet/18/ filled by technicians for record the information of biogas digesters that are in normal operation in the 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>Yuqing Energy Office supervises and manages the whole monitoring system to ensure its reliable operation which has been confirmed by interview with the representatives from Yuqing Energy Office and by checking the biodigester users' database/11/ which record the relevant information about the user of biogas digesters (such as the name, location and serial number of the householder).<br>The technician took casual inspection to the rural households, in the event of either biogas digester or biogas stove in the biogas system was disused, the reason will be written down clearly and reported to the local energy office immediately which has been confirmed by interview with the representatives from Yuqing Energy Office and technicians and via checking the original record data sheet/18/ filled by technicians. Local energy office recorded it in the file of rural household and verified it/17/. |

| **Data/Parameter** | $MS\%_{i,y}$ |
|---|---|
| Description | The amount of pig manure fed into the biogas digester |
| Unit | % |
| Value applied for this monitoring period | 100 |
| 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record whether all the pig manure fed into the biogas digester or not monthly in the monitoring period. |

| | | |
|---|---|---|
| | 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? | In order to determine the amount of pig manure fed into the biogas digester, PP have followed sampling approach and randomly selected 328 households for interview (different samples for different year during this monitoring period).<br>The amount of pig manure fed into the biogas digester was determined based on the record of if all the amount of pig manure fed into the biogas digester monthly.<br>At the beginning of each monitoring period, the 328 samples were selected randomly and then the Biogas Monitoring Form prepared by PP for data collection was distributed to each sample household and the sample households filled the forms with the information of if all amount of pig manure fed into the biogas digester.<br>The data is summarized this mornitoring period to determine the value of this parameter.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ with monthly data were provided to the verification team.<br>Via checking these evidence, it is confirmed that the amount of pig manure fed into the biogas digester is all 100% for each sample household.<br>Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered, it is confirmed that amount of pig manure fed into the biogas digester is all 100% for each sample household who used the biodigester during this monitoring period which are same to the MR values, thus it is confirmed that the values in MR is reasonable and correct.<br>Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. |

| | |
|---|---|
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes.<br>The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record whether all the pig manure fed into the biogas digester or not monthly in the 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 site inspection to the sample households, it is verified that the biogas digesters are installed below the pig pen and the inlet is directly connected to livestock room so that the manure can be drained into the digester directly, there is no incremental transportation for the manure.<br>Furthermore, the technicians train and guide the farmers how to record and how to operate system correctly and then technicians take on-site inspection monthly to confirm the manure is all directly fed into the digester which has been confirmed by interview with technicians. |

| **Data/Parameter** | Application of sludge |
|---|---|
| Description | The proper application of biogas sludge |
| Unit | % |
| Value applied for this monitoring period | 100% for dry fertilizer |
| Measuring /Reading /Recording frequency | Every application |
| 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/5/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record application of biogas sludge in the monitoring period. |
| 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? | In order to determine the application of biogas sludge for each application, PP have followed sampling approach and randomly selected 328 households for interview |

| | | |
|---|---|---|
| | | (different samples for different year during this monitoring period).<br>The application of biogas sludge for each application was determined based on the record of application of biogas sludge for each application.<br>At the beginning of each monitoring period, the 328 samples were selected randomly and then the Biogas Monitoring Form prepared by PP for data collection was distributed to each sample household and the sample households filled the forms with the information of application of biogas sludge for each application.<br>The data is summarized this mornitoring period to determine the value of this parameter.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ with each application data were provided to the verification team.<br>Via checking these evidence, it is confirmed that the application of biogas sludge for each application is all 100% used for dry fertilizer for each sample household who used the biodigester during this monitoring period.<br>Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered, it is confirmed that application of biogas sludge for each application is all 100% used for dry fertilizer for each sample household who used the biodigester during this monitoring period which are same to the MR values, thus it is confirmed that the values in MR is reasonable and correct.<br>Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record application of biogas sludge in the monitoring period. |

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|---|---|
| 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 technician instructs the farmers in charge on how to treat the biogas sludge which has been confirmed by interview with household and technicians. And the technicians in each village were responsible for supervising the treatment of biogas sludge to ensure the correct application for dry fertilizer. The technicians inspect the use and monitoring of farmers from time to time, and recorded and reported the situation to the local energy office which has been confirmed by interview with representatives from local energy office and technicians. |

| **Data/Parameter** | $H_{stove}$ |
|---|---|
| Description | Average Operating hours of the stoves for each household |
| Unit | hour |
| Value applied for this monitoring period | 1,374.21 (01/01/2017 - 31/12/2017)<br>1,379.90 (01/01/2018 - 31/12/2018)<br>1,319.54 (01/01/2019 - 31/12/2019) |
| Measuring /Reading /Recording frequency | Daily records by household user and archived monthly by the Local energy office |
| 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/5/.<br>The annual use time of the biogas stove is the actual operating days ($H_{digester}$/24 hours) of the biogas digester per year multiplied by the daily operating hours of the biogas stove |
| Monitoring equipment with accuracy | N/A<br>The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record of operating hours of the stoves for each household. |
| 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? | In order to determine the average operating hours of the stoves for each household, PP have followed sampling approach and randomly selected 328 households for interview (different samples for different year during this monitoring period).<br>The average operating hours of the stoves for each household was determined based on the record of daily operating hours of the stoves for each household. |

| | | |
|---|---|---|
| | | At the beginning of each monitoring period, the 328 samples were selected randomly and then the Biogas Monitoring Form prepared by PP for data collection was distributed to each sample household and the sample households filled the forms with the information of daily operating hours of the stoves for each household.<br>The annual use time of the biogas stove is the actual operating days ($H_{digester}$/24 hours) of the biogas digester per year multiplied by the daily operating hours of the biogas to determine the yearly value of this parameter during this monitoring period.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ with daily data of operating hours of the stoves for each household were provided to the verification team.<br>Via checking these evidence, it is confirmed that the average operating hours of the stoves for each household is<br>1,374.21 (01/01/2017 - 31/12/2017)<br>1,379.90 (01/01/2018 - 31/12/2018)<br>1,319.54 (01/01/2019 - 31/12/2019)<br>Monitoring has been done through a statistically valid sample of the households where the systems are installed as per the relevant requirements for sampling in the latest standard for sampling and surveys.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered, it is confirmed that average operating hours of the stoves for each household who used biodigesterd durng this monitoring period is calculated as higher than the MR values, thus it is confirmed that the values in MR is conservative.<br>Based on the result of acceptance sampling, the monitoring records are deemed acceptable in accordance with the sampling standard. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | Yes. The value is derived from sampling survey record as listed in the ER calculation sheet/4/ and cross checked by the original Biogas Monitoring Forms filled by the households/16/ for record of operating hours of the stoves for each household. |
| | Does the data management ensure correct transfer of data and reporting of emission reductions and are | Yes, QA/QC procedures were found to be appropriate and reliable. |

| | |
|---|---|
| necessary QA/QC processes in place? | The farmers recorded the daily use time of the biogas stove in the form which has been confirmed by checking the filled form/16/ and interview with household samples. The technician have checked the use and monitoring of the farmers from time to time and gave guidance which has been confirmed by interview with technicians. The local energy office has conducted statistical analysis on the data every year which has been confirmed by interview with representatives from Yuqing energy office. |

| **Data/Parameter** | $EF_{FF,CO2}$ |
|---|---|
| Description | Carbon emission factor per unit of energy of coal that would have been used in the baseline |
| Unit | $kgCO_2/TJ$ |
| Value applied for this monitoring period | 87,300 (01/01/2017 - 31/12/2017)<br>87,300 (01/01/2018 - 31/12/2018)<br>87,300 (01/01/2019 - 31/12/2019) |
| Measuring /Reading /Recording frequency | Review appropriateness of the values 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from China Statistic Bureau/45/ |
| 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 China Statistic Bureau/45/, via checking the data issued by China Statistic Bureau/45/ for year 2017 to 2019, it is verified that the data of 87,300 $kgCO_2/TJ$ for the $CO_2$ emission factor of fossil fuel (coal) is correct and consistent for these three years. |
| 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 |

| Data/Parameter | T |
|---|---|
| Description | Annual Average ambient temperature at local weather station nearby project site |
| Unit | ℃ |
| Value applied for this monitoring period | 16.4 (01/01/2017 - 31/12/2017)<br>16.1 (01/01/2018 - 31/12/2018)<br>16.1 (01/01/2019 - 31/12/2019) |
| Measuring /Reading /Recording frequency | Review appropriateness of the values 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 PDD/5/. |
| Monitoring equipment with accuracy | N/A<br>The value is derived from office source meteorological data/20/ issued by Local Bureau of Meteorology for year 2017, 2018 and 2019 respectively |
| 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 office source meteorological monthly data issued by Local Bureau of Meteorology/20/, the annual data is calculated by average the monthly mean temperature for year 2017 to 2019, it is verified that the data listed in MR is correct and consistent with the data issued by Local Bureau of Meteorology/20/. |
| If applicable, has the reported data been cross-checked with other available data? (Yes / No) | The monthly office source meteorological data issued by Local Bureau of Meteorology/20/ is cross check by the meteorological data in public website of Yuqing Meteorological Bureau Information network/41/ |
| Does the data management ensure correct transfer of data and reporting of emission reductions and are necessary QA/QC processes in place? | N/A |

| Data/Parameter | $MCF_j$ |
|---|---|
| Description | Annual methane conversion factors for each manure management system j |
| Unit | % |

| | | |
|---|---|---|
| | Value applied for this monitoring period | 29 (01/01/2017 - 31/12/2017)<br>29 (01/01/2018 - 31/12/2018)<br>29 (01/01/2019 - 31/12/2019) |
| | Measuring /Reading /Recording frequency | Review appropriateness of the values 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 PDD/5/. |
| | Monitoring equipment with accuracy | N/A<br>The value is derived from definition of manure management system in IPCC 2006 Guidelines for National Greenhouse Gas Inventories (volume 4 Chapter. 10: Livestock Emissions)/37/ |
| | 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 definition of manure management system in IPCC 2006 Guidelines for National Greenhouse Gas Inventories (volume 4 Chapter. 10: Livestock Emissions)/37/.<br>In accordance with the certification from the local Bureau of Meteorology/20/, during the monitoring period (01/01/2017- 31/12/2017) the annual average temperatures is 16.4℃. so according to conservation, the methane conversion factors (MCF) is 29%. During the monitoring period (01/01/2018-31/12/2018) the annual average temperatures is 16.1℃, the methane conversion factors (MCF) is 29%. And during the monitoring period (01/01/2019-31/12/2019) the annual average temperatures is 16.1 ℃ , the methane conversion factors (MCF) is 29%. |
| | If applicable, has the reported data been cross-checked with other available data? (Yes / No) | N/A<br>The value is derived from definition of manure management system in IPCC 2006 Guidelines for National Greenhouse Gas Inventories (volume 4 Chapter. 10: Livestock Emissions)/37/. |
| | 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** | CAR 05, CAR 06, CAR 07 | |
| **Conclusion** | CAR 05, CAR 06 and CAR 07 are closed. Refer to Appendix 4 for findings' resolution. | |

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| | It can be confirmed that all monitoring parameters have been measured / determined without material misstatements and in line with all applicable standards and relevant requirements. |

### D.6.3. Sustainable Data and parameters monitored

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| **Means of verification** | The monitoring of the contribution to sustainable development during this monitoring period according to the sustainability monitoring plan in GS latest approved Passport/6/ is verified as follows table D-1. |
| **Findings** | CAR 08 |
| **Conclusion** | CAR 08 is closed. Refer to Appendix 4 for findings' resolution.<br>In summary, the verification team confirms that the project under the Gold Standard results in a positive contribution to local sustainable development. |

**Table D-1 Assessment of Sustainable Data and parameters monitored**

| Sustainable development indicator | Methods and equipments used | Frequency | Assessment by verification team |
|---|---|---|---|
| **1 - Air quality** | Monitoring Concentrations and emissions of $SO_2$ and particulate pollutants<br><br>Review the survey on the local stakeholders | Annually – the frequency is confirmed as incompliance with the GS latest approved Passport/6/ | As per the SD monitoring plan in GS latest approved Passport/6/, the "Air quality" indicator is monitored randomly selected households (Random sampling) were interviewed by trained technicians designated by PP.<br>Sampling size was determined as 328 households annually which is same to the samples for carbon monitoring. The results of sampling survey were recorded and collected by technicians. Then, PP conducted completeness and consistency checks of the collected data and use final correct value in MR.<br>The verification team has checked the questionnaires of the monitoring survey filled by the sampled households/19/. The sample size was considered as appropriate and conservative as verified in section C.4.1 above.<br>During the acceptance sampling survey the verification team interviewed 75 of these PP sampled (328*3years) households on a random sampling basis. The acceptance sampling of 75 households did not show any discrepancy. Therefore, the verification team confirms the conclusion that the sampling survey records are reliable and the sampling result is acceptable.<br>Moreover, CTI has checked the training records of the technicians/21/ and confirmed that data collection, transfer and processing functioned properly.<br>Therefore, it is confirmed that the project activity meets the future target for this parameter defined in the GS passport. In conclusion, it is verified that the "Air quality" is positively improved during this monitoring period compared to the baseline. |

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|---|---|---|---|
| | | | Therefore, based on the document review and onsite verification, verification team is of the opinion that the Concentrations and emissions of $SO_2$ and particulate pollutants has been decreased i.e. the target as defined in the GS passports for this SD indicator has been reached. |
| **2 - Soil Condition** | Monitoring Soil refilling<br>The Local energy office representatives record soil refilling (Utilization of digester sludge) | Annually – the frequency is confirmed as incompliance with the GS latest approved Passport/6/ | As per the SD monitoring plan in GS latest approved Passport/6/, the "Soil condition" indicator is monitored randomly selected households (Random sampling) were recorded by Local energy office representatives annually.<br>Sampling size was determined as 328 households annually which is same to the samples for carbon monitoring parameter of "Application of sludge".<br>The application of biogas sludge for each application was determined based on the record of application of biogas sludge for each application.<br>Survey data of the 328 samples for year 2017, 2018 and 2019 as listed in the ER calculation sheet/4/ and the Biogas Monitoring Forms filled by the households/16/ with each application data were provided to the verification team.<br>Via checking these evidence, it is confirmed that the application of biogas sludge for each application is all 100% used for dry fertilizer for each sample household who used the biodigester during this monitoring period.<br>And via site interview with technicians, it is confirmed that the technicians are in charge of treatment of methane manure, each time (usually once to twice a year) they will check and record the exact methods of treatment and resolve the immediate rectification problem.<br>The results of sampling survey were recorded and collected by Local energy office representatives annully based on the Biogas Monitoring Forms filled by the households/16/ with each application data.<br>Then, PP conducted completeness and consistency checks of the collected data and use final correct value in MR.<br>The verification team has also visited 75 of the households (25 samples for each year) on a random sampling basis and interviewed the households during on-site inspection. Via the data gathered, it is confirmed that application of biogas sludge for each application is all 100% used for dry fertilizer for each sample household who used the biodigester during this monitoring period which are same to the MR values, thus it is confirmed that the values in MR is reasonable and correct. |

| | | | |
|---|---|---|---|
| | | | Moreover, CTI has checked the training records of the technicians and sampled households/21/ and confirmed that data collection, transfer and processing functioned properly.<br>Therefore, it is confirmed that the project activity meets the future target for this parameter defined in the GS passport. In conclusion, it is verified that the "Soil Condition" is positively improved during this monitoring period compared to the baseline.<br>Therefore, based on the document review and onsite verification, verification team is of the opinion that the Soil refilling has been achieved as the sludge is used as fertilizer i.e. the target as defined in the GS passports for this SD indicator has been reached. |
| **3 - Quality of Employment** | Training, labour conditions<br><br>Review the training records and employee handbook/PP's regulations | Annually – the frequency is confirmed as incompliance with the GS latest approved Passport/6/ | As per the SD monitoring plan, training and labour conditions, i.e. technicians trained to get necessary knowledge about digester maintenance familiarize themselves with the digester operation principles and master the cause of malfunction and how to handle is chosen parameter for this indicator.<br>According to the GS passport/6/, the project region are very mountainous and rural, and the households are unlikely to have the knowledge and capacity to operate and maintain the RMDs adequately by themselves in the baseline.<br>The employee handbook/22/ and PP's regulations of daily maintenance for the technicians/23/ have been checked, it is confirmed that the related labor conditions and job duties have been specified in the docs.<br>Furthermore, via checking the training records/21/, it is confirmed that the project activity has created 3 times training during this monitoring period which fulfilles the requested frequency annually.<br>Therefore, it is confirmed that the project activity meets the future target for this parameter defined in the GS passport. In conclusion, it is verified that the "Quality of employment" is positively improved during this monitoring period compared to the baseline.<br>Therefore, based on the document review and onsite verification, verification team is of the opinion that the necessary knowledge has been provided to technicians i.e. the target as defined in the GS passports for this SD indicator has been reached. |
| **4 - Quantitative employment and income generation** | Number of jobs created and the staff salaries paid by the project | Annually – the frequency is confirmed as incompliance with the GS | As per the SD monitoring plan, number of jobs created and the staff salaries paid by the project is chosen parameter for this indicator.<br>According to the GS passport/6/, via checking the work permit acquired by the technicians/24/ |

| | | | |
|---|---|---|---|
| | Review the work permit acquired by the technician and the name list of technician in the Methane Service Center established in each town and the pay slip of the employment | latest approved Passport/6/ | and the annually name list of technician in the local energy office established in each town/25/, it is confirmed that the number of jobs created for this monitoring period, and these jobs are all provided to the local farmers comparing with the agricultural and heavy manual work with no fixed contract and working hours in the baseline scenario.<br>In addition, via checking the yearly pay slip of the employment/26/, it is confirmed that the yearly salary was paid to technicians. Hence, it is concluded that the project has effectively improved the quantitative employment and income generation to local farmers by providing benefits that would not have been granted in the baseline situation.<br>Therefore, it is confirmed that the project activity meets the future target for this parameter defined in the GS passport. In conclusion, it is verified that the "Quantitative employment and income generation" is positively improved during this monitoring period compared to the baseline.<br>Therefore, based on the document review and onsite verification, verification team is of the opinion that the number of jobs created and the staff salaries paid by the project i.e. the target as defined in the GS passports for this SD indicator has been reached. |
| **5 - Livelihood of the poor** | Money spent to collect fuel<br><br>It can monitor the decreasing cost through receipt check and survey and have a investigate to the local people | Annually – the frequency is confirmed as incompliance with the GS latest approved Passport/6/ | As per the SD monitoring plan, Money spent to collect fuel is chosen parameter for this indicator.<br>Sampling size was determined as 328 households annually which is same to the samples for carbon monitoring. The results of sampling survey were recorded and collected by technicians. Then, PP conducted completeness and consistency checks of the collected data and use final correct value in MR.<br>The verification team has checked the questionnaires of the monitoring survey filled by the sampled households/19/. The sample size was considered as appropriate and conservative as verified in section C.4.1 above.<br>During the acceptance sampling survey the verification team interviewed 75 of these PP sampled (328*3years) households on a random sampling basis. The acceptance sampling of 75 households did not show any discrepancy. Therefore, the verification team confirms the conclusion that the sampling survey records are reliable and the sampling result is acceptable.<br>Therefore, it is confirmed that the project activity meets the future target for this parameter defined in the GS passport. In conclusion, it is verified that the "Livelihood of |

| | | | |
|---|---|---|---|
| | | | the poor" is positively improved during this monitoring period compared to the baseline.<br>Therefore, based on the document review and onsite verification, verification team is of the opinion that Local farmers no longer spent money to purchase goal after the implementation of the project. |

## D.7. Compliance with the calibration frequency requirements for measuring instruments

| | |
|---|---|
| **Means of verification** | According to GS requirement, VVB shall determine whether the calibration of the measuring equipment that has an impact on the claimed GHG emission reductions or net anthropogenic GHG removals is conducted by the PP at a frequency specified in the applied methodologies and/or the registered monitoring plan.<br>As there is no measuring equipment stated in the latest approved PDD/5/ and approved passport/6/, all the parameters values are applied default values or public data or calculated based on sample survey results, thus this compliance requirement is not applicable of the project. |
| **Findings** | N/A |
| **Conclusion** | This compliance requirement is not applicable of the project. |

## D.8. Assessment of data and calculation of emission reductions or net removals

### D.8.1. Calculation of baseline GHG emissions or baseline net GHG removals by sinks

**Means of verification**

According to GS requirement, a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of baseline GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology.

Any assumptions used in emission or removal calculations have been justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified by cross checks with related evidence, and these assessment to each monitoring paramters have been demonstrated in the section D.6.2 of this report.

According to the applied methodologies and approved PDD, there are two parts of the baseline emissions, baseline emissions from an existing animal manure management system and baseline emissions due to the reduction of coal consumption.

The baseline emissions from manure management system $BE_{CH4,y}$ can be calculated as formula below：

$$BE_{CH_4,y} = GWP_{CH_4} \cdot D_{CH_4} \cdot UF_b \cdot \sum_{j,LT} MCF_j \cdot B_{0,LT} \cdot N_{LT,y} \cdot VS_{LT,y} \cdot MS\%_{Bl,j}$$

Where:

| | |
|---|---|
| $BE_{CH4,y}$ | Baseline emissions from manure management for each household in year y ($tCO_2e$) |
| $GWP_{CH4}$ | Global Warming Potential (GWP) of $CH_4$ (25 from 01/01/2013 onwards) |
| $D_{CH4}$ | $CH_4$ density (0.00067 $t/m^3$ at room temperature (20 $^oC$) and 1 atm pressure) |
| $UF_b$ | Model correction factor to account for model uncertainties (0.94) |
| $j$ | Index for animal manure management system |

| | |
|---|---|
| $LT$ | Index for all types of livestock |
| $MCF_i$ | Annual methane conversion factor (MCF) for the baseline animal manure management system j. |
| $B_{o,LT}$ | Maximum methane producing potential of the volatile solid generated for animal type LT ($m^3$ $CH_4(kgVS)^{-1}$) |
| $N_{LT,y}$ | Annual average number of animals of type LT in year y (numbers) |
| $VS_{LT,y}$ | Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year) |
| $MS\%_{BI,j}$ | Fraction of manure handled in baseline animal manure management system j |

For all the parameters used for calculation, $GWP_{CH4}$, $D_{CH4}$, $UF_b$, $B_{0,LT}$, $VS_{LT,y}$, $MS\%_{BI,j}$ are ex-ante determined value in line with the latest approved PDD and applied methodology. While, $MCF_j$, $N_{LT,y}$ are monitored parameters and have been assessed in above section D.6.2.

The final calculation result of baseline emissions of each year within this monitoring period is listed as below,

2017: From 01/01/2017 to 31/12/2017 in this monitoring period:

$BE_{CH4,y}$ = 25 × 0.00067t/$m^3$ × 0.94 × 29% × 0.29$m^3CH_4$/kgVS × 4.290head × 0.3kg.dry.matter/animal/day × (8,752.945hour / 24hour) × 100%

= 0.6215 $tCO_2e$/household

2018: From 01/01/2018 to 31/12/2018 in this monitoring period:

$BE_{CH4,y}$ = 25 × 0.00067t/$m^3$ × 0.94 × 29% × 0.29$m^3CH_4$/kgVS × 4.231head × 0.3kg.dry.matter/animal/day × (8,753.079hour / 24hour) × 100%

= 0.6129 $tCO_2e$/household

2019: From 01/01/2019 to 31/12/2019 in this monitoring period:

$BE_{CH4,y}$ = 25 × 0.00067t/$m^3$ × 0.94 × 29% × 0.29$m^3CH_4$/kgVS × 3.315head × 0.3kg.dry.matter/animal/day × (8,753.141hour / 24hour) × 100%

= 0.4802 $tCO_2e$/household

The baseline emissions due to coal consumption $BE_{thermal,CO2,y}$ can be calculated as formula below：

$$BE_{thermal,CO_2,y} = (EG_{thermal,y} / \eta_{BL,thermal}) * EF_{FF,CO_2} \quad (2)$$

Where:

| | |
|---|---|
| $BE_{thermal,CO2,y}$ | Baseline $CO_2$ emission from coal combustion for household before the installation of digester in the city *i*, $tCO_2e$ $yr^{-1}$ for each household ($tCO_2e$) |
| $EG_{thermal,y}$ | The net quantity of heat supplied for household by the project activity, TJ |
| $EF_{FF,CO2}$ | Carbon emission factor per unit of energy of coal that would have been used in the baseline |
| $\eta_{BL,thermal}$ | Thermal efficiency for the traditional coal furnace of the baseline situation |

And according to the PDD,

$$EG_{thermal,y}=kW_{thermal} \times H_{stove} \times DI \quad (3)$$

Where:

| | |
|---|---|
| $kW_{thermal}$ | The thermal capacity of the biogas stove for household, kW |

| | |
|---|---|
| | $H_{stove}$ — Average Operating hours of the stoves for each household, hour<br>DI — Thermal efficiency of the biogas stove<br>For all the parameters used for calculation, $kW_{thermal}$, DI, $\eta_{BL,thermal}$ are ex-ante determined value in line with the latest approved PDD and applied methodology. While, $H_{stove}$, $EF_{FF,CO2}$ are monitored parameters and have been assessed in above section D.6.2.<br>The final calculation result of $CO_2$ baseline emissions of each year within this monitoring period is listed as below,<br>2017: From 01/01/2017 to 31/12/2017 in this monitoring period:<br>$EG_{themal,y}$ = 2.33 kW × 1,374.21 hour × 55% × 3,600KJ/kWh = 6,339,780 KJ<br>$BE_{themal,CO2,y}$ = (6,339,780 KJ / 25%) × 87,300kg$CO_2$/TJ/$10^{12}$ = 2.2138 t$CO_2$e/ household<br>2018: From 01/01/2018 to 31/12/2018 in this monitoring period:<br>$EG_{themal,y}$ = 2.33 kW × 1,379.70 hour × 55% × 3,600KJ/kWh = 6,365,107 KJ<br>$BE_{themal,CO2,y}$ = (6,365,107 KJ / 25%) × 87,300kg$CO_2$/TJ/$10^{12}$ = 2.2226 t$CO_2$e/ household<br>2019: From 01/01/2019 to 31/12/2019 in this monitoring period:<br>$EG_{themal,y}$ = 2.33 kW × 1,319.54 hour × 55% × 3,600KJ/kWh = 6,087,565 KJ<br>$BE_{themal,CO2,y}$ = (6,087,565 KJ / 25%) × 87,300kg$CO_2$/TJ/$10^{12}$ = 2.1257 t$CO_2$e/ household<br>The total baseline emissions can be calculated as formula below：<br>For 01/01/2017– 31/12/2017 in this monitoring period<br>$BE_y = BE_{CH4,y} + BE_{thermal,CO2,y}$ = 2.8353 t$CO_2$e/household<br>For 01/01/2018– 31/12/2018 in this monitoring period<br>$BE_y = BE_{CH4,y} + BE_{thermal,CO2,y}$ = 2.8355 t$CO_2$e/household<br>For 01/01/2019– 31/12/2019 in this monitoring period<br>$BE_y = BE_{CH4,y} + BE_{thermal,CO2,y}$ = 2.6059 t$CO_2$e/household |
| **Findings** | CAR 09 |
| **Conclusion** | CAR 09 are closed. Refer to Appendix 4 for findings' resolution.<br>According to GS requirement, the verification team checked and recalculated the ER calculation sheet and confirms that:<br>A complete set of data for the specified monitoring period was available and is duly reported.<br>As indicated above, the description with regard to cross-check of reported data is included under respective parameter.<br>Appropriate methods and formulae for calculating baseline GHG emissions or baseline net GHG removals were followed.<br>Appropriate emission factor, IPCC default values, GWP value and other reference values have been correctly applied.<br>The sheet is reproducible and calculation was correctly applied. |

### D.8.2. Calculation of project GHG emissions or actual net GHG removals by sinks

| | |
|---|---|
| **Means of verification** | According to GS requirement, a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of project GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology.<br>Any assumptions used in emission or removal calculations have been |

justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified by cross checks with related evidence, and these assessment to each monitoring paramters have been demonstrated in the section D.6.2 of this report.

There are two parts of the project emissions, project emissions from physical leakage and project emissions due to the coal consumption.

As per the PDD, the project activity does not involve on-site consumption of fossil fuels and electricity and does not involve geothermal process. Thus the calculation of project emissions according to AMS-I.C (version 19.0) is not applicable for the project activity and it is taken as zero.

The project emissions from physical leakage $PE_{PL,y}$ can be calculated as formula below：

$$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{i,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y}$$

Where:

| | |
|---|---|
| $PE_{PL.y}$ | Project emissions from physical leakages in the biogas digesters for each household in Year y ($tCO_2e$) |
| $GWP_{CH4}$ | Global Warming Potential for $CH_4$ (25 from 01/01/2013 onwards) |
| $D_{CH4}$ | $CH_4$ density (0.00067 t/m$^3$ at room temperature (20deg C) and 1 atm pressure) |
| $i$ | Index for animal manure management system |
| $LT$ | Index for all types of livestock |
| $B_{o,LT}$ | Maximum methane producing potential of the manure type treated in the biogas (m$^3$ $CH_4$ (kg dm)$^{-1}$) |
| $N_{LT,y}$ | Annual average number of animals of type LT in year y (numbers) |
| $VS_{LT,y}$ | Volatile solids for livestock LT entering the animal manure management system in year y (on a dry matter weight basis, kg dm/animal/year) |
| $MS\%_{Bl,j}$ | Fraction of manure handled in baseline animal manure management system j |

For all the parameters used for calculation, $GWP_{CH4}$, $D_{CH4}$, $B_{0,LT}$, $VS_{LT,y}$ are ex-ante determined value in line with the latest approved PDD and applied methodology. While $N_{LT,y}$, $MS\%_{i,y}$ are monitored parameters and have been assessed in above section.

The final calculation result of project emissions of each year within this monitoring period is listed as below,

2017: From 01/01/2017 to 31/12/2017 in this monitoring period:

$PE_{PL,y}$ = 0.1 × 25 × 0.00067t/m$^3$ × 0.29m$^3$$CH_4$/kgVS × 4.290head × 0.3kg.dry.matter/animal/day × (8,752.945hour / 24hour) × 100%

= 0.2280 $tCO_2e$/household

2018: From 01/01/2018 to 31/12/2018 in this monitoring period:

$PE_{PL,y}$ = 0.1 × 25 × 0.00067t/m$^3$ × 0.29m$^3$$CH_4$/kgVS × 4.231head × 0.3kg.dry.matter/animal/day × (8,753.079hour / 24hour) × 100%

= 0.2249 $tCO_2e$/household

2019: From 01/01/2019 to 31/12/2019 in this monitoring period:

$PE_{PL,y}$ = 0.1 × 25 × 0.00067t/m$^3$ × 0.29m$^3$$CH_4$/kgVS × 3.315head × 0.3kg.dry.matter/animal/day × (8,753.141hour / 24hour) × 100%

= 0.1762 $tCO_2e$/household

| | |
|---|---|
| | The total project emissions can be calculated as formula below<br>According to the PDD, $PE_{y,i}=PE_{PL,y}$<br>Where:<br>$PE_{y,i}$ — Annual project GHG emission of each household after the installation of digester ($tCO_2e$/yr)<br>For 01/01/2017– 31/12/2017 in this monitoring period<br>**Total project emission**: $PE_{y,I} = PE_{PL,y}$ = 0.2280 $tCO_2e$/household<br>For 01/01/2018– 31/12/2018 in this monitoring period<br>**Total project emission**: $PE_{y,I} = PE_{PL,y}$ = 0.2249 $tCO_2e$/household<br>For 01/01/2019– 31/12/2019 in this monitoring period<br>**Total project emission**: $PE_{y,I} = PE_{PL,y}$ = 0.1762 $tCO_2e$/household |
| **Findings** | CAR 10 |
| **Conclusion** | CAR 10 is closed. Refer to Appendix 4 for findings' resolution.<br>According to GS requirement, the verification team checked and recalculated the ER calculation sheet and confirms that:<br>A complete set of data for the specified monitoring period was available and is duly reported.<br>As indicated above, the description with regard to cross-check of reported data is included under respective parameter.<br>Appropriate methods and formulae for calculating project GHG emissions or project net GHG removals were followed.<br>Appropriate emission factor, IPCC default values, GWP value and other reference values have been correctly applied.<br>The sheet is reproducible and calculation was correctly applied. |

### D.8.3. Calculation of leakage GHG emissions

| | |
|---|---|
| **Means of verification** | Calculations of leakage GHG emissions have been verified whether carried out in accordance with the formulae and methods described in the latest approved PDD and the applied methodologies.<br>As per the PDD and applied methodology, the leakage is determined by AMS-III.R is<br>For methodology AMS-III.R.(version 03.0) titled "Methane recovery in agricultural activities at household/small farm level", if the energy methane recover and combustion equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.<br>As per the PDD and applied methodology, the leakage is determined by AMS-I.C. is<br>For methodology AMS-I.C (Version 19.0) titled "Thermal energy production with or without electricity," if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.<br>Via on-site inspection and checking the PDD, it is confirmed that both paragraphs are not applicable to the proposed project as no equipment was transferred from or to another activity during this monitoring period. |
| **Findings** | N/A |
| **Conclusion** | According to the approved PDD and applied methodologies, it is confirmed that the leakage emissions of this project are 0. |

### D.8.4. Summary of calculation of GHG emission reductions or net anthropogenic GHG removals by sinks

**Means of verification**

According to GS requirement, a complete set of data for the specified monitoring period is verified. Information provided in the monitoring report has been crosschecked with other sources such as sampling survey results and commission records. Calculations of GHG emission reductions have been verified whether carried out in accordance with the formulae and methods described in the latest approved monitoring plan and the applied methodology.

Any assumptions used in emission or removal calculations have been justified. Whether the appropriate emission factor, IPCC default values, GWP and other reference values have been correctly applied. The correctness of information provided in the monitoring report has been verified as above section D.6.

According to the PDD,

The emission reduction per household within the project activity during a given year y is the amount of the household GHG baseline emissions minus the household GHG emissions with biogas digester installed under the project, as follows:

GHG emission reduction per household($ER_{y,i}$)

The emission reduction per household within the project activity during a given year y can be calculated based on equation:

$$ER_{y,i} = BE_{y,i} - PE_{y,i} - LE_y$$

Calculation of total project GHG emission reductions ($ER_y$)

$$ER_y = \sum_i N_d \times ER_{y,i}$$

Where:

| | |
|---|---|
| $ER_y$ | Total GHG emission reductions of this project activity ($tCO_2e/yr$) |
| $N_d$ | The annual number of biogas systems including the digesters and biogas stoves engaged in the project |

Hence the final emission reductions per household during this monitoring period are calculated as below table

| Item | Baseline emissions or baseline net GHG removals by sinks/HH($t CO_2e$) | Project emissions or actual net GHG removals by sinks/HH ($t CO_2e$) | Leakage ($t CO_2e$) | Emission reductions or net anthropogenic GHG removals by sinks/HH ($t CO_2e$) |
|---|---|---|---|---|
| 01/01/2017-31/12/2017 | 2.8353 | 0.2280 | 0 | 2.6073 |
| 01/01/2018-31/12/2018 | 2.8355 | 0.2249 | 0 | 2.6106 |
| 01/01/2019-31/12/2019 | 2.6059 | 0.1762 | 0 | 2.4297 |

And the final emission reductions during this monitoring period are calculated as below table

| Item | Emission reductions or net anthropogenic GHG removals by | $N_d$ The annual number of biogas systems including the digesters and biogas stoves | Emission reductions or net anthropogenic GHG removals |
|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | **sinks/HH (t $CO_2e$)** | **engaged in the project** | **by sinks/HH (t $CO_2e$)** |
| | 01/01/2017-31/12/2017 | 2.6073 | 18,529 | 48,310 |
| | 01/01/2018-31/12/2018 | 2.6106 | 18,534 | 48,384 |
| | 01/01/2019-31/12/2019 | 2.4297 | 16,417 | 39,888 |
| | **Total** | | | **136,582** |
| **Findings** | CAR 11 | | | |
| **Conclusion** | CAR 11 is closed. Refer to Appendix 4 for findings' resolution.<br>According to Para. 357 to 359 of VVS for PA Version 02.0, the verification team checked and recalculated the ER calculation sheet and confirms that:<br>A complete set of data for the specified monitoring period was available and is duly reported.<br>As indicated above, the description with regard to cross-check of reported data is included under respective parameter.<br>Appropriate methods and formulae for calculating GHG emission reductions or net GHG removals were followed.<br>Appropriate emission factor, IPCC default values, GWP value and other reference values have been correctly applied.<br>The sheet is reproducible and calculation was correctly applied. | | | |

### D.8.5. Comparison of actual GHG emission reductions or net anthropogenic GHG removals by sinks with estimates in latest 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 latest approved PDD.<br>Compared the monitoring report with the latest approved PDD, and found the actual value achieved during this monitoring period is 136,582 $tCO_2e$, which is less than values (150,207 $tCO_2e$) estimated according to the latest approved PDD. |
| **Findings** | N/A |
| **Conclusion** | The MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the latest approved PDD.<br>It is confirmed that the ex-post determined value was found to be lower than the ex-ante estimated value. |

### D.8.6. Remarks on difference from estimated value in latest approved PDD

| | |
|---|---|
| **Means of verification** | Compared the monitoring report with the latest approved PDD, and found the actual value achieved during this monitoring period is 136,582 $tCO_2e$, which is less than values (150,207 $tCO_2e$=3 years×50,069 $tCO_2e$/yr) estimated according to the latest approved PDD, due to the utilization rate of biogas digester of the project has getting down especially in 2019 in the project area. |
| **Findings** | CL 01 |
| **Conclusion** | CL 01 is closed. Refer to Appendix 4 for findings' resolution.<br>The MR includes a comparison of the calculated actual emission reductions with the ex-ante calculated values in the latest approved PDD.<br>It is confirmed that the ex-post determined value was found to be much lower than the ex-ante estimated value. |

| | |
|---|---|
| | No further justification or explanation is deemed required as actual emissions of this monitoring period do not exceed the ex-ante calculated emission reductions. |

### D.9. Grievance Mechanism/Continues Inputs

| | |
|---|---|
| **Means of verification** | As confirmed through the onsite visit and interview with the local stakeholders, the Grievance Mechanism/Continues Inputs has been in place.<br>As per the onsite visit, the comment/process book is available outside the wall of the meeting room of Yuqing Energy Office; and as per the interview with the stakeholders, they have access to provide feedback through this book about the project activity, they can also provide feedback through the PP's telephone number of +86 851-7990160 and email address of gz_lwy@126.com and through GS's telephone number of +41 (0) 22 788 7080 and email address of info@goldstandard.org as all the above contact information have been provided on the book. |
| **Findings** | CAR 12 |
| **Conclusion** | CAR 12 is closed. Refer to Appendix 4 for findings' resolution.<br>During the on-site inspection of the local energy office, by checking the grievance book and on-site interview with the HHs and technicians, it is confirmed that there is no grievance raised and no legal contest or dispute during the monitoring period. Furthermore, no comments were received during this monitoring period.<br>All the methods of continuous input /grievance mechanism are confirmed during on-site investigation and interviews.<br>There are no grievances/complaints received from the stakeholders during this monitoring period of the project activity. |

## SECTION E. Double Counting Assessment

The DOE has checked for double counting by reviewing all relevant registries including CDM/44/, VCS/43/ and other GHGs programs such as EU ETS, IREC or subnational, various regional schemes such as the Canadian and American provincial/state-based schemes. It is 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.

Furthermore, for the project users and serial number of biodigester management, to avoid the double counting, PP has implemented the related actions as following,

i. PP has added a serial number to each bio-digester installed and kept the numbers in a database;

   Verifier checked the biodigester users' database/11/ comparing with all the serial numbers with on-site investigation, verification team found that all sampled bio-digesters have a unique serial number painted or carved on the cover of bio-digesters or the wall of the house which is same to the database and no duplication was observed.

ii. Each bio-digester is corresponded to one HH, and each HH has unique ID number of one person in family;

iii. PP will only account for the HHs with bio-digesters installed by PP, thus removing the risk that other HHs may be double counted.

Via checking the biodigester users' database/11/ against the ER calculation sheet/4/, it is confirmed that only bio-digesters installed by PP are accouted, no risk of counting other HHs into the ER sheet.

In conclusion, the risk of double counting is unlikely to happen.

**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 auditor qualification.

## SECTION G. Verification opinion

The verification team assigned by the VVB (CTI) concludes that the 2nd periodic verification of GS project activity “Yuqing Rural Methane Digesters Project in Guizhou Province” in Guizhou Province, China, as described in the latest approved PDD (Version 02, 05/01/2015), Passport (Version 04, 03/03/2017) and monitoring report (Version 4.0, 11/12/2021), meets all relevant requirements set by the Gold Standard version 2.2 requirements and relevant guidance provided by GS.

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 GHG emission reductions. And the project activity 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 2nd periodic verification of the emission reductions that have been reported for the GS project activity "Yuqing Rural Methane Digesters Project in Guizhou Province" in Guizhou Province, China for the period 01/01/2017 to 31/12/2019.

The verification is based on the baseline and monitoring methodology AMS-I.C.– Thermal energy production with or without electricity (version 19.0) and AMS-III.R.– Methane recovery in agricultural activities at household/small farm level (version 03.0), the latest approved PDD (Version 02, 05/01/2015), Passport (Version 04, 03/03/2017) and the monitoring report (Version 4.0, 11/12/2021). 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 PP and local energy office are responsible for the collection, calculation and determination of the GHG data in accordance with the monitoring plan and the reporting of GHG emission reductions on the basis set out within the project monitoring report.

It is CTI's responsibility to provide an independent verification statement on the reported GHG emission reductions for the project. Based on an understanding of the risks associated with reporting of GHG emission 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 GHG emission reductions are fairly stated.

CTI confirms that the GHG emission reductions are calculated without material misstatements. And the project activity is contributed to sustainability development.

Based on the evidence and information that are considered necessary to guarantee that GHG emission reductions are appropriately calculated, CTI confirms that the emission reductions from the "Yuqing Rural Methane Digesters Project in Guizhou Province" in Guizhou Province, P. R. China during the monitoring period 01/01/2017 to 31/12/2019 as follows:

Monitoring Period Number: 2nd

Monitoring period: 01/01/2017 to 31/12/2019

Emission reductions: 136,582 $tCO_2e$

| Year | Emission Reductions ($tCO_2e$) |
|---|---|
| 2017 | 48,310 |
| 2018 | 48,384 |
| 2019 | 39,888 |

Du wenjun

**Mr. Du Wenjun**
Team Leader
11/12/2021

Li Ziqi

**Mr. Li Ziqi**
Technical Reviewer
11/12/2021

# Appendix 1. Abbreviations

| Abbreviations | Full texts |
|---|---|
| **BE** | Baseline emission |
| **CA** | Corrective Action / Clarification Action |
| **CAR** | Corrective Action Request |
| **CDM** | Clean Development Mechanism |
| **CL** | Clarification Request |
| **$CO_2$** | Carbon dioxide |
| **$CO_2e$** | Carbon dioxide equivalent |
| **DverR** | Draft Verification Report |
| **ER** | Emission Reduction |
| **FAR** | Forward Action Request |
| **GHG** | Greenhouse gas(es) |
| **GS** | Gold Standard |
| **GSR** | Gold Standard Requirement |
| **GST** | Gold Standard Toolkit |
| **GSP** | Gold Standard Passport |
| **GWP** | Global Warming Potential |
| **HH** | Household |
| **IPCC** | Intergovernmental Panel on Climate Change |
| **MP** | Monitoring Plan/Monitoring Period |
| **MR** | Monitoring Report |
| **NGO** | Non-Governmental Organization |
| **PA** | Project Activity |
| **PDD** | Project Design Document |
| **PE** | Project Emission |
| **PP** | Project Participant/ Project Proponent |
| **PS** | Project Standard |
| **QA/QC** | Quality Assurance / Quality Control |
| **RMD** | Rural Methane Digesters |
| **SD** | Sustainability Development |
| **SDI** | Sustainability Development Indicator |
| **SDM** | SD Matrix |
| **SN** | Serial Number |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **VER** | Voluntary Emission Reduction |
| **VVS** | Validation and Verification Standard |

# Appendix 2. Competence of team members and technical reviewers

## Mr. Wenjun DU

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

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

| Scope | Technical Area |
|---|---|
| SS 1: Energy industries (renewable/non-renewable sources) | TA 1.1: Energy generation from renewable energy sources |
| | TA 1.2: Energy generation from renewable energy sources |
| SS 13: Waste handling and disposal | TA 13.1: Solid waste and wastewater |
| | TA 13.2: Manure |

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

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 01/01/2021

Gold Standard®

# Mr. Ziqi LI

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: Energy generation from non-renewable sources |
| | TA 1.2: Energy generation from renewable energy sources |
| SS 4: Manufacturing industries | TA 4.1. Cement and lime production |
| SS 5: Chemical industry | TA 5.1: Chemical industry |
| | TA 5.2: Caprolactam, nitric and adipic acid |
| SS 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride | TA 11.1: Emissions of fluorinated gases |
| | TA 11.2: Refrigerant gas production |
| SS 12: Solvents use | TA 12.1: Chemical industry |
| SS 13: Waste handling and disposal | TA 13.1: Solid waste and wastewater |
| | TA 13.2: Manure |

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

Approved by:

Wu LIN Wu Lin

Technical Competent Manager

Shenzhen, 01/08/2020

# Appendix 3. Documents reviewed or referenced

| No. | Author | Title | References to the document | Provider |
|---|---|---|---|---|
| 1. | PP | Monitoring Report for this project (the 2nd monitoring period),<br>Draft Version 1.0 for submitted to VVB, dated 30/07/2020 | - | PP |
| 2. | PP | Monitoring Report for this project (the 2nd monitoring period),<br>Final Version 4.0, dated 11/12/2021 | - | PP |
| 3. | PP | Emission Reduction Calculation spreadsheet for this project<br>Draft Version 01 for submitted to VVB, dated 30/07/2020 corresponding to MR version 01 | - | PP |
| 4. | PP | Emission Reduction Calculation spreadsheet for this project<br>Final Version 02, dated 16/04/2021 | Emission Reduction Calculation spreadsheet for this project including annual sampling survey summarized results | PP |
| 5. | PP | Approved PDD for this project version 02, dated 05/01/2015 | - | PP |
| 6. | PP | Approved GS Passport for this project<br>version 04, dated 03/03/2017 | - | PP |
| 7. | TüV Rheinland (China) Ltd. | GS Validation report for this project<br>version 01, dated 17/03/2015 | - | PP |
| 8. | PP | GS 1st Monitoring Report<br>Version 02, dated 20/04/2017 | - | PP |
| 9. | TüV Rheinland (China) Ltd. | GS 1st periodic Verification report for this project<br>version 02, dated 20/04/2017 | - | PP |
| 10. | PP | Sample size calculation spreadsheet | Sample size calculation spreadsheet for 328 result calculation process | PP |
| 11. | PP | End users' database | End users' database with name, digester serial No., digester location, and construction date were clearly indicated | PP |
| 12. | Local government | Notice on the existing total household number | Notice on the existing total household number as well as the RMD number included issued by the local government | PP |
| 13. | Local energy office | Acceptance Report of digester | Acceptance Report of digester issued by Local energy office | PP |
| 14. | Local energy office | Coal cooking stove test report | Coal cooking stove test report issued by Local energy office | PP |
| 15. | Third party | Biogas stove test report | Biogas stove test report issued by third party in Feb. 2012 | PP |

| | | | | |
|---|---|---|---|---|
| 16. | PP | Biogas Monitoring Forms | Biogas Monitoring Forms filled by the households | PP |
| 17. | Local energy office | Yearly record of $N_d$ | Yearly record of annual number of biogas systems including the digesters and biogas stoves engaged in the project issued by local energy office for year 2017, 2018 and 2019 | PP |
| 18. | PP | Original record data sheet of $N_d$ | Original record data sheet filled by technicians for record the information of biogas digesters that are not in normal operation in the monitoring period | PP |
| 19. | PP | Sampling survey forms | Sampling survey forms for 328 samples yearly | PP |
| 20. | Guizhou Bureau of Meteorology | Office source meteorological data | Office source meteorological data issued by Guizhou Bureau of Meteorology for year 2017, 2018 and 2019 respectively | PP |
| 21. | PP and local energy office | Technical Training Records | Technical Training Records<br>1. Annually training records of the technicians<br>2. Annually training records of the sampled biodigester users<br>3. Annually training records of the data collection, recording and management of technicians and local energy office staffs | PP |
| 22. | PP | Employee handbook | Employee handbook | PP |
| 23. | PP | PP's regulations | PP's regulations of daily maintenance for the technicians | PP |
| 24. | PP | Work permit | Work permit acquired by the technicians | PP |
| 25. | Local energy office | Name list | Annually name list of technician in the local energy office established in each town | PP |
| 26. | PP | Yearly pay slip | Yearly pay slip of the employment | PP |
| 27. | CDM Executive Board | Guidelines for Sampling and Surveys for CDM Project Actives and Programme of Activities, version 4.0, 16/10/2015 | EB 67, Annex 6 https://cdm.unfccc.int/Reference/Guidclarif/index.html | Others |
| 28. | CDM Executive Board | Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 08.0 | https://cdm.unfccc.int/Reference/Standards/index.html | Others |
| 29. | CDM Executive Board | Application of the global warming potentials to Clean Development Mechanism project activities and programme of activities for the | Para. 66 of EB69 meeting report | Others |

| | | | | |
|---|---|---|---|---|
| | | second commitment period of the Kyoto Protocol | | |
| 30. | CDM Executive Board | Approved CDM methodology: AMS-I.C.: Thermal energy production with or without electricity (version 19.0) | https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC | Others |
| 31. | CDM Executive Board | Approved CDM methodology: AMS-III.R.: Methane recovery in agricultural activities at household/small farm level (version 03.0) | http://cdm.unfccc.int/methodologies/DB/JQHRMGL23TWZ081T6G7G1RZ63GM1BZ | Others |
| 32. | CDM Executive Board | CDM Standard: CDM validation and verification standard for project activities (version 02.0) | https://cdm.unfccc.int/Reference/Standards/index.html | Others |
| 33. | CDM Executive Board | CDM Standard: CDM project standard for project activities (version 02.0) | https://cdm.unfccc.int/Reference/Standards/index.html | Others |
| 34. | CDM Executive Board | CDM Procedure: CDM project cycle procedure for project activities (version 02.0) | https://cdm.unfccc.int/Reference/Procedures/index.html | Others |
| 35. | CDM Executive Board | "Applicability of sectoral scopes" (version 01.0, EB88, Annex 04) | EB88 https://cdm.unfccc.int/Reference/Standards/index.html | Others |
| 36. | UNDP | UNDP, 2002 | Clean Energy for Development and Economic Growth: Biomass and Other Renewable Energy Options to Meet Energy and Development Needs in Poor Nations | Others |
| 37. | IPCC | 2006 IPCC Guidelines for National Greenhouse Gas Inventories: work book | https://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html | Others |
| 38. | CTI | On-site picture: pigpens, biogas digesters, living condition of each household, On-site information collected table and questionnaires filled by randomly selected sampling households | - | Others |
| 39. | The Gold Standard | Gold Standard version 2.2 | www.goldstandard.org | Others |
| 40. | The Gold Standard | The Gold Standard Toolkit (and its annexes) version 2.2 | www.goldstandard.org | Others |
| 41. | Yuqing Meteorological Bureau | Yuqing Meteorological Bureau Information network | - | Others |
| 42. | Gold Standard Organization | Gold Standard | http://www.goldstandard.org/ | Others |
| 43. | VERRA | VCS | https://verra.org/ | Others |
| 44. | UNFCCC | UNFCCC | http://cdm.unfccc.int | Others |
| 45. | China Statistic Bureau | China Statistic Bureau | http://www.stats.gov.cn/english/ | Others |

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

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

| **FAR ID** | 01 | **Section no.** | D.6.3 | **Date:** 30/05/2021 |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| In future SD survey, the PP shall provide details of interviewed persons such as name, address, gender, age, mobile/phone No., bio digester ID with signature/stamp. The PP shall design indicator questions more specific like 'do you think that the safety conditions in this project is better or worse? Why?' or 'do you think that the salaries offered to workers in this project is better than the average salary? Why?' | | | | |
| **Project participant response** | | | | **Date:** 19/10/2021 |
| In the SD survey of this monitoring period, the detailed information of the interviewees, including name, address, gender, age, telephone number, biogas digester ID and signature have been included.<br>Meanwhile "Do you think that the safety condition in this project is better or worse? Why?" "Do you think the use of biogas has improved the air environment of your home?" "Do you think that the salaries offered to workers in this project is better than the average salary? Why?" "Is the biogas sludge in your biogas digester used for soil fertilization?" etc., such kind of questions were designed in the questionnaire. | | | | |
| **Documentation provided by project participant** | | | | |
| /19/ | | | | |
| **VVB assessment** | | | | **Date:** 19/10/2021 |
| By checking Sampling survey forms and site visit interview, it is confirmed that details of interviewed persons such as name, address, gender, age, mobile/phone No., bio digester ID with signature/stamp has been included in the survery forms.<br>Questions more specific like 'do you think that the safety conditions in this project is better or worse? Why?' or 'do you think that the salaries offered to workers in this project is better than the average salary? Why?' are also included in the in the survery forms.<br>FAR 01 is closed. | | | | |

| **FAR ID** | 02 | **Section no.** | D.9 | **Date:** 30/05/2021 |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| GS email info@goldstandard.org as well as the GS telephone number +41 (0) 22 788 7080 shall be added in the grievance mechanism and informed to local stakeholders. | | | | |
| **Project participant response** | | | | **Date:** 19/10/2021 |
| The info@goldstandard.org and +41 (0) 22 788 7080 are listed in the grievance book and also informed to local stakeholders via bulletin. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 19/10/2021 |
| By checking grievance book and site visit interview, it is confirmed that GS email info@goldstandard.org as well as the GS telephone number +41 (0) 22 788 7080 are included in the grievance book and available for local stakeholders.<br>FAR 02 is closed. | | | | |

**Table 2. CL from this verification**

| **CL ID** | 01 | **Section no.** | E.6 | **Date:** 14/08/2020 |
|---|---|---|---|---|
| **Description of CL** | | | | |
| In the section E.6, the comparison between the actual values achieved during this monitoring period and values estimated in ex-ante calculation of registered PDD is not clarified. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |

| |
|---|
| The comparison between the actual values achieved during this monitoring period and values estimated in ex-ante calculation of registered PDD has been clarified for the total value for this monitoring period.<br>In the registered PDD, the estimated annual emission reduction is 50,069 $tCO_2e$, so the estimated emission reduction in this monitoring period should be 150,207 $tCO_2e$ for three years. However, during the monitoring period from 01/01/2017 to 31/12/2019, only 136,582 $tCO_2e$, which is lower than the estimated value of PDD. The main reason why the emission reduction is lower than the estimated value is that since 2019, the utilization rate of biogas digester of the project has become lower. Therefore, the emission reduction in this monitoring period is lower than the expected PDD emission reduction. |
| **Documentation provided by project participant** |
| /2/<br>/4/ |
| **VVB assessment** **Date:** 17/04/2021 |
| The revised MR is checked, it is confirmed that the comparison between the atual values achieved during this monitoring period and values estimated in ex-ante calculation of registered PDD has been clarified.<br>Compared the monitoring report with the latest approved PDD, and found the actual value achieved during this monitoring period is 136,582 $tCO_2e$, which is less than values (150,207 $tCO_2e$=3 years×50,069 $tCO_2e$/yr) estimated according to the latest approved PDD, due to the utilization rate of biogas digester of the project has getting down especially in 2019 in project area.<br>CL 01 is closed. |

**Table 3. CAR from this verification**

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 01 | **Section no.** | A.1 | **Date:** 14/08/2020 |
| **Description of CAR** | | | | |
| In the section A.1 of MR, the description of purpose of the project activity and the measure taken to reduce GHG emissions is not clear, the purpose and measures are not described. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| The description of this section has been added, the purpose and measures had been described.<br>The project results in a reduction of greenhouse gas (GHG) emissions in these two ways: on the one hand, the recovery and utilization of biogas from digested slurry in the biogas digester reduce $CH_4$ emission that would otherwise have been stored in a deep pit. It can prevent methane ($CH_4$) emissions by changing the management practice of manure in order to achieve the controlled anaerobic digestion equipped with methane recovery system. On the other hand, the biogas are used as thermal energy to replace the fossil fuel (coal) currently used to meet the households' daily energy needs for cooking and heating. The thermal generated from the burning biogas replace effectively equal amount of the heat which would otherwise be generated by coal stove | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, it is confirmed that the description of purpose of the project activity and the measure taken to reduce GHG emissions is added and the purpose and measures are described accordingly. Via site visit and comparing the descriptions with the registered PDD, it is verified that the information is correct and actual.<br>CAR 01 is closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 02 | **Section no.** | A.2 | **Date:** 14/08/2020 |
| **Description of CAR** | | | | |
| In the section A.2, the figure of project location is missing. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| The figure of project location has been added. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, it is confirmed that the figure of project location is added which is verified as consistent with the approved PDD and confirmed by site inspection.<br>CAR 02 is closed. | | | | |

| CAR ID | 03 | Section no. | A.3 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section A.3, the sectoral scopes of the two methodologies are not in line with the latest EB standard Applicability of sectoral scopes (version 01.0). | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| This part has been updated, ”Scope 13: Waste handling and disposal” and “For more information on the baseline and monitoring methodology please refer to the UNFCCC website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html” | | | | |
| **Documentation provided by project participant** | | | | |
| /2/<br>/35/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that the scope of 15 is changed to 13 Waste handling and disposal.<br>In the appoved PDD (version 02 dated 05/01/2015), the scopes related to the project are scope 1 and scope 15, but based on the latest EB standard Applicability of sectoral scopes (version 01.0), for methodology AMS-I.C, if electricity and/or heat is generated using biogas, then sectoral scope 1 and 13 apply and AMS-III.R. also related to scope 1 and 13. Thus, in this report, the scope 13 instead 15 to in line with the latest EB standard Applicability of sectoral scopes (version 01.0).<br>CAR 03 is closed. | | | | |

| CAR ID | 04 | Section no. | B.1 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section B.1, the technical description of the project including technical parameters of main equipment is missing. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| The technical description of the project including technical parameters of main equipment has been added. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/<br>/13/<br>/15/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that technical description of the project has been added into the MR. Also the technical parameters of main equipment are added and verified as correct by checking the Acceptance Report of digester/13/ and Biogas stove test report/15/ comparing with the information in PDD.<br>CAR 04 is closed. | | | | |

| CAR ID | 05 | Section no. | D.2 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section D.2, for the monitored parameter $N_d$, How to monitor this parameter is not clearly described, if sampling survey used and who and how conducted the survey is not clear. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| In the section D.2, all contents have been supplemented and changed according to the opinions. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that the monitoring method of $N_d$ is described which is confirmed as actual and reasonable.<br>Refer to section D.6.2 of this report for detail assessment.<br>CAR 05 is closed. | | | | |

| CAR ID | 06 | Section no. | D.2 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section D.2, for the monitored parameter $H_{stove}$, how to get the final values for year 2017, 2018 and 2019 based on the monitoring method is not clarified. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |

| |
|---|
| For the monitored parameter $H_{stove}$, how to get the final values for year 2017, 2018 and 2019 based on the monitoring method has been clarified. |
| **Documentation provided by project participant** |
| /2/ |
| **VVB assessment** **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that the method to get the final values for year 2017, 2018 and 2019 based on the monitoring method is described.<br>Refer to section D.6.2 of this report for detail assessment.<br>CAR 06 is closed. |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 07 | **Section no.** | D.2 | **Date:** 14/08/2020 |
| **Description of CAR** | | | | |
| In the section D.2, for the monitored parameter $EF_{FF,CO2}$, the source of data is not valid and not in line with the PDD. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| In the section D.2, for the monitored parameter $EF_{FF,CO2}$, the source of data has been changed correctly. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that the source of data of parameter $EF_{FF,CO2}$ is revised to be valid and in line with the PDD.<br>Refer to section D.6.2 of this report for detail assessment.<br>CAR 07 is closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 08 | **Section no.** | D.3 | **Date:** 14/08/2020 |
| **Description of CAR** | | | | |
| In the section D.3, for all the SD monitoring parameters,<br>1. The actual situation of the parameter during this monitoring period is not provided.<br>2. The actual way of monitoring is not provided. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| 1. The actual situation of the parameter during this monitoring period has been provided.<br>2. The actual way of monitoring has been provided. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| 1. The revised MR is checked, CTI confirmed that the actual situation of the parameter during this monitoring period is provided.<br>2. The revised MR is checked, CTI confirmed that the actual way of monitoring is provided.<br>Refer to section D.6.3 of this report for detail assessment.<br>CAR 08 is closed. | | | | |

| | | | | |
|---|---|---|---|---|
| **CAR ID** | 09 | **Section no.** | E.1 | **Date:** 14/08/2020 |
| **Description of CAR** | | | | |
| In the section E.1,<br>1. The unit for each parameter is not provided with the description.<br>2. The value of 3,600 used in the $EG_{themal,y}$ calculation is not explained. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| 1. The unit for each parameter has been provided with the description.<br>2. The value of 3,600 used in the $EG_{themal,y}$ calculation has been explained. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| 1. The revised MR is checked, CTI confirmed that the unit for each parameter is provided with the description<br>2. The revised MR is checked, CTI confirmed that the value of 3,600 used in the $EG_{themal,y}$ calculation is explained.<br>CAR 09 is closed. | | | | |

| CAR ID | 10 | Section no. | E.2 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section E.2,<br>1. The unit for each parameter is not provided with the description.<br>2. The final results of total project emission is not provided. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| 1. The unit for each parameter has been provided with the description.<br>2. The final results of total project emission has been provided. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| 1. The revised MR is checked, CTI confirmed that the unit for each parameter is provided with the description.<br>2. The revised MR is checked, CTI confirmed that the final results of total project emission is provided.<br>CAR 10 is closed. | | | | |

| CAR ID | 11 | Section no. | E.4 | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| In the section E.4, the emission calculation method is not in line with the PDD. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| In the section E.4, the emission calculation method has been changed to be consistend with the PDD. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that emission calculation method is in line with the PDD. Refer to section D.8.4 of this report for detail assessment.<br>CAR 11 is closed. | | | | |

| CAR ID | 12 | Section no. | F | Date: 14/08/2020 |
|---|---|---|---|---|
| **Description of CAR** | | | | |
| The continuous input / grievance mechanism expression method and details are not provided in MR corresponding to the actual method used and information in this monitrong period. | | | | |
| **Project participant response** | | | | **Date:** 16/04/2021 |
| The continuous input / grievance mechanism expression method are provided according to the GS passport request and the detail information of this monitoring period have been provided accordingly. | | | | |
| **Documentation provided by project participant** | | | | |
| /2/ | | | | |
| **VVB assessment** | | | | **Date:** 17/04/2021 |
| The revised MR is checked, CTI confirmed that continuous input / grievance mechanism expression method and details related to this monitoring period is added.<br>During the on-site inspection of the local energy office, by checking the grievance book and on-site interview with the HHs and technicians, it is confirmed that there is no grievance raised and no legal contest or dispute during the monitoring period.<br>All the methods of continuous input /grievance mechanism are confirmed during on-site investigation and interviews.<br>There are no grievances/complaints received from the stakeholders during this monitoring period of the project activity.<br>CAR 12 is closed. | | | | |

**Table 4. FAR from this verification**

| FAR ID | N/A | Section No. | | Date: DD/MM/YYYY |
|---|---|---|---|---|
| **Description of FAR** | | | | |
| | | | | |
| **Project participant response** | | | | **Date:** DD/MM/YYYY |
| | | | | |

| Documentation provided by project participant | |
|---|---|
| | |
| **DOE assessment** | **Date:** DD/MM/YYYY |
| | |