



YUNSHUI WASTEWATER TREATMENT PLANT PROJECT IN GUANGDONG PROVINCE



Document Prepared by Shenzhen CTI International Certification Co., Ltd

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Summary:

- *A description of the project*

The project activity is a wastewater treatment project located in Guangdong Province, P.R China including 16 wastewater treatment plants, of which the main purpose is to reduce environmental pollution and destroy methane emissions from the open anaerobic lagoons in baseline scenario, the best available low-cost solution for wastewater treatment. The wastewater is composed of residents' domestic wastewater within the service area. In the project scenario, the maximum design influent flow is 175,150 m³/d, the influent COD concentration are within range of 300mg/L to 550 mg/L and effluent COD concentration is 40 mg/L. An aerobic biological treatment technology, which includes pre-treatment process, secondary biological treatment process, tertiary deep treatment process and sludge treatment process is used by the project activity. During the 10 years fixed crediting period, by utilization the aerobic biological treatment technology, the project activity avoids the emission of methane that would be generated by the open anaerobic lagoons used in baseline scenario. It's estimated that the project activity could achieve average annual GHG emission reductions of 83,042 tCO_{2e} during the crediting period. The project started operation on 03-September-2020 with the VCS Ref. No. 2938.

- *A description of the validation and verification*

The approved CDM methodology AM0080 "Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater" (version 01) is applied to quantify the GHG emission reductions achieved in this project. The calculation of the GHG emission reductions is carried out in a transparent and conservative manner. This project is being developed in conjunction with the validation and 1st periodic of verification.

- *The purpose and scope of validation and verification*

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

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

- *The method and criteria used for validation and verification*

Validation and Verification is conducted using Shenzhen CTI International Certification Co., Ltd (CTI) procedures in line with the requirements specified in the latest version of the VCS Validation and Verification Manual and applying auditing techniques. The validation/verification team assessed the project activity's compliance against the VCS Standard Version 4.3, the selected CDM methodology and the joint project description and monitoring report. The project is eligible under Project Scope 13. The validation/verification criteria followed the guidance documents provided by VCS included the following:

VCS Standard Version 4.3, VCS Program Guide Version 4.2 and the applied CDM methodology AM0080 "Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater" (version 01).

- *The number of findings raised during validation and verification*

In the course of the validation and verification, 32 Corrective Action Requests (CARs), 10 Clarification Requests (CLs) were raised and successfully closed. The assessment is included in the report.

- *Any uncertainties associated with the validation and verification*

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

- *Summary of the validation and verification conclusions*

Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd. has commissioned the Shenzhen CTI International Certification Co., Ltd to carry out the Verified Carbon Standard (VCS) validation joint with 1st periodical verification of the project, “Yunshui Wastewater Treatment Plant Project in Guangdong Province” (VCS ID 2938) with regard to the relevant requirements of VCS Standard Version 4.3. CTI confirms all validation and verification activities including objectives, scope and criteria, level of assurance, project description, monitoring and monitoring report adhere to VCS Standard Version 4.3 and all associated updated as documented in this report, are complete.

CTI concludes that the project activity “Yunshui Wastewater Treatment Plant Project in Guangdong Province” in China, as described in the final version of Joint-Project-Description-Monitoring-Report, meets all relevant requirements for VCS validation and verification activity and correctly applied the methodology AM0080, Version 01. Hence CTI is able to certify that the GHG emission reductions from the project during the monitoring period from 03-September-2020 to 30-June-2022 were generated as 110,002 tCO₂e which can be claimed as VCU.

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1 INTRODUCTION

1.1 Objective

Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd. has commissioned the Shenzhen CTI International Certification Co., Ltd to carry out the Verified Carbon Standard (VCS) validation joint with 1st periodical verification of the project for the monitoring period from 03-September-2020 to 30-June-2022 (both days included).

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

The objective of verification is to have an independent review ex-post determination by a VVB of the monitored GHG emission reductions that have occurred as a result of the project activity implemented during a defined monitoring period. The evaluation is done against the requirements of the VCS Standard Version 4.3 based on the monitoring report. In order to confirm that the GHG emission reductions sound reasonable and meet the identified criteria, the verification involves the assessment of monitoring plan conformance to VCS rules and applied methodology. Verification is a requirement and is seen as necessary to provide assurance on the generation of VCUs.

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the project description (PD) to validate that (a) the project design is actual, (b) the baseline scenario is correctly defined as per the applied methodology and relate tools, (c) the project is additional, (d) the monitoring plan can be implemented and is transparent and adequate and (e) all data and information used for ex-ante calculation of emission reductions is of projected and/or hypothetical nature. The Joint-PD-MR is reviewed against the criteria stated in VCS Standard Version 4.3/51/ and the approved baseline and monitoring methodology AM0080 Version 01/42/. The validation was based on the requirements VCS Validation and Verification Manual and VCS Standard Version 4.3 applying auditing techniques. The validation is not meant to provide any consulting towards the project participants. However, stated requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

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

1.3 Level of Assurance

All GHG sinks, sources and GHG emissions equal to or greater than 2% of the total GHG assertions are considered. The project is expected to generate average GHG emission reductions of 83,042 tCO_{2e} per year, and therefore can be considered as a project per the VCS rules, in regards to its ER value, subject to a 2% materiality threshold.

The assessment was conducted to provide a reasonable level of assurance of compliance against the defined audit criteria and materiality threshold within the audit scope. Based on the audit findings the validation and verification statement reasonably assure that the GHG assertion is materially correct and is a fair representation of the GHG data and information.

1.4 Summary Description of the Project

The project is implemented by Yunshui Guangdong Environmental Protection Co., Ltd. which is a wastewater treatment project located in Guangdong Province, P.R. China including 16 wastewater treatment plants, of which the main purpose is to reduce environmental pollution and destroy methane emissions from the open anaerobic lagoons in baseline scenario, the best available low-cost solution for wastewater treatment. The wastewater is composed of residents' domestic wastewater within the service area. In the project scenario, the maximum design influent flow is 175,150 m³/d, the influent COD concentration are within range of 300mg/L to 550 mg/L and effluent COD concentration is 40 mg/L. An aerobic biological treatment technology, which includes pre-treatment process, secondary biological treatment process, tertiary deep treatment process and sludge treatment process is used by the project activity which has been confirmed by site inspection and checking the Feasibility Study Report (FSR) of the project/5/.

The project activity introduces 16 wastewater treatment plants to using the same treatment process (A²O+MBR) instead of the residents' domestic wastewater would have been treated through a series of deep open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the wastewater, aerobic wastewater treatment plants produce essentially no methane emissions during the entire process of wastewater treatment, which has been verified by on-site inspection, and

checking the related documentations, interview with the project implementer.

During the 10 years fixed crediting period from 03-September-2020 to 02-September-2030, by utilization the aerobic biological treatment technology, the project activity avoids the emission of methane that would be generated by the open anaerobic lagoons used in baseline scenario. It's estimated that the project activity could achieve average annual GHG emission reductions of 83,042 tCO₂e during the crediting period.

The project is expected to reduce methane emissions of the open anaerobic lagoons in baseline scenario. Thus the project generates GHG emission reductions and produces financial, social and environmental benefits. The project has resulted in the local sustainable development as described in Section 1 of the Joint-PD-MR/1/. The project applied to be registered as a VCS project activity and the 110,002 tCO₂e of emission reductions have been certified as verified carbon units (VCUs) for 1st monitoring period from 03-September-2020 to 30-June-2022.

2 VALIDATION AND VERIFICATION PROCESS

2.1 Method and Criteria

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

The purpose of the validation and verification is to present a risk assessment for determining the nature and extent of validation and verification procedures necessary to ensure the risk of auditing error is reduces to a reasonable level. According to the ISO14064-3, the criteria are the policy, procedure or requirement used as reference against which evidence is compared. Therefore, validation of the project description and verification of the monitoring plan and the reported project results were measured for compliance against the following criteria:

- VCS Standard, v4.3/51/
- VCS Program Guide, v4.2/50/
- VCS Program Definitions, v4.2/49/
- VCS-Joint-Project-Description-Monitoring-Report-Template-v4.1/47/

The validation and verification process derived from all items in the validation and verification criteria stated above. Field inspection and techniques based on the project parameters, scope and best professional judgement of the validation and verification team in order to meet a reasonable level of assurance. The validation and verification consisted of the following three phase:

- Document review
- On-site assessment
- The resolution of outstanding issues and the issuance of the final joint validation and verification report and certification.

The validation and verification process derived from all items in the validation and verification criteria stated above. Field inspection and techniques based on the project parameters, scope and best professional judgement of the validation and verification team in order to meet a reasonable level of assurance.

There is no sampling approach utilized by PP and VVB during validation and verification.

2.2 Document Review

The VCS Joint-PD-MR/1/ of the project and supporting background documents related to the project implementation were reviewed. Documents review was conducted to ensure consistency with and identify any deviation from VCS program requirements. Desk review included an examination of the project design details, baseline scenario, additionality, ex ante and monitoring data and parameters, and quantification of GHG emission reductions.

Furthermore, the validation and verification team used additional documentation by third parties like host party legislation, technical reports referring to the project design details, baseline scenario, additionality, monitoring or to the basic conditions and technical data.

The references used in the course of this validation and verification are summarized in Appendix 3.

The validation and verification were performed basing on the documents check and site inspection/measurements, refer to the section 3 and 4 of this report for the validation and verification process detail and corresponding documents review.

2.3 Interviews

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

The objective of the interview process was to solicit important information from personnel related to project and relevant to the validation and verification process. Onsite interviews and information discussions were conducted with representatives from project implementer/I1/, Operation Staffs of the wastewater treatment plants/I2/, local officers/I3/, local residents/I4/ and VCS consultant/I5/. The interviews were performed by the validation and verification team on-site (within the project area, in Guangdong Province, P.R. China) and the following is a list of the main interviewees and subject.

No.	Interviewee			Date	Subject, Reference Number/ID	Team member
	Last name	First name	Affiliation			
1.	Huang /I1/	Danning	Yunshui Guangdong Environmental Protection Co., Ltd. Environmental department / General Manager	11-July-2022~16-July-2022	Discussion on project financials, project design and implementation, Main equipment, Technical parameters, Baseline, Additionality, Project boundary, Monitoring plan, Monitoring devices, SDG impacts, ER calculation, Local legislation to wastewater Treatment	Tong Dezheng Du Wenjun
2.	Wang	Weiyun	Yunshui Guangdong Environmental Protection Co., Ltd. Environmental department / Assistant of General Manager			
3.	Jiang	Bowen	Yunshui Guangdong Environmental Protection Co., Ltd. Environmental department / Staff of Admin Dep.			

4.	Song/I2/	Letian	Xiaqiao Town wastewater Treatment Plant/plant chief	11-July-2022	Scenario before the project started, Wastewater source, Project implementation, Wastewater Treatment method and process, Sludge treatment, Main equipment, Biogas production, COD concentration, General info of interviewee, name, gender, Age, Education, Location How to obtain this job? What is the main work? Training provided, Salary level, if satisfied	Tong Dezheng Du Wenjun
5.	Wang	Xuehai	Xiaqiao Town wastewater Treatment Plant/staff	11-July-2022		
6.	Lv	Junming				
7.	Wu	Changchang				
8.	Zhu	Yingyang	Qujie Town wastewater Treatment Plant/plant chief	11-July-2022		
9.	Ye	Wanran	Qujie Town wastewater Treatment Plant/staff	11-July-2022		
10.	Lu	Liquan				
11.	Zhu	Hongchang				
12.	Wang	Yuezhang	Xinyi City Dingbao Town wastewater treatment Plant/plant chief	11-July-2022		
13.	Dong	Jianian	Xinyi City Dingbao Town wastewater treatment Plant/Staff	11-July-2022		
14.	Huang	Yongnian				
15.	Fang	Minglang				
16.	Ding	Yuhua	Xinyi City Qianpai Town wastewater treatment Plant/plant chief	12-July-2022		
17.	Yin	Haoying	Xinyi City Qianpai Town wastewater treatment Plant/Staff	12-July-2022		
18.	Feng	Jiazhi				
19.	Qing	Gaoyi				
20.	Xu	Yingjie	Xianqiao South Wastewater Treatment Plant/plant chief	13-July-2022		
21.	Lu	Derong	Xianqiao South Wastewater Treatment Plant/staff	13-July-2022		
22.	Ren	Yuanzheng				
23.	Wu	Xinrong				
24.	Kong	Xiangyang	Qiankeng Town North wastewater Plant/plant chief	13-July-2022		

25.	Ding	Yuanwei	Qiankeng Town North wastewater Plant/staff	13-July-2022		
26.	Wen	Yuquan				
27.	Yuan	Jingming				
28.	Liang	Tianyou	Shangsha Town wastewater Treatment Plant/plant chief	14-July-2022		
29.	Zhao	Chengshu ang	Shangsha Town wastewater Treatment Plant/staff	14-July-2022		
30.	Chen	Lihui				
31.	Xia	Anyi				
32.	Xu	Siyuan	Baita Town wastewater Treatment Plant/plant chief	14-July-2022		
33.	Cai	Hean	Baita Town wastewater Treatment Plant/staff	14-July-2022		
34.	Shen	Feizhou				
35.	Song	Zhiyong				
36.	Lu	Xingyu	Luoding Fourth Domestic wastewater Treatment Plant/plant chief	14-July-2022		
37.	Ren	Xingbo	Luoding Fourth Domestic wastewater Treatment Plant/staff	14-July-2022		
38.	Ma	Guanghua				
39.	Jiang	Jiasheng				
40.	Shi	Derun	Shitan Town wastewater Treatment Plant/plant chief	15-July-2022		
41.	Shao	Hanliang	Shitan Town wastewater Treatment Plant/staff	15-July-2022		
42.	Jiang	Jiamu				
43.	Zhang	Yuansi				
44.	Yuan	Jiayun	Litan Town wastewater Treatment Plant/plant chief	15-July-2022		
45.	Lu	Jingguo		15-July-2022		

46.	Lin	Tianrui	Litan Town wastewater Treatment Plant/staff			
47.	Liu	Yuanjie				
48.	Wang	Jitong	Jiulong Town wastewater Treatment Plant/plant chief	15-July-2022		
49.	Shao	Hongzhi	Jiulong Town wastewater Treatment Plant/staff	15-July-2022		
50.	Bai	Tianze				
51.	Zhu	Yangbing				
52.	Wu	Jiarui	Shakou Town wastewater Treatment Plant/plant chief	15-July-2022		
53.	Qiu	Weibo	Shakou Town wastewater Treatment Plant/staff	15-July-2022		
54.	Jiang	Chengyi				
55.	Yao	Tongguan g				
56.	Wen	Chengyin	Bomei Town wastewater Treatment Plant/plant chief	16-July-2022		
57.	Duan	Siyuan	Bomei Town wastewater Treatment Plant/staff	16-July-2022		
58.	Du	Yangxu				
59.	Lv	Chengye				
60.	Ma	Xinhong	Nantang Town wastewater Treatment Plant/plant chief	16-July-2022		
61.	Li	Mincai	Nantang Town wastewater Treatment Plant/staff	16-July-2022		
62.	Song	Yangshu				
63.	Mao	Ning				
64.	Wang	Gong	Chikeng Town wastewater Treatment Plant/plant chief	16-July-2022		
65.	Cao	Yongning	Chikeng Town wastewater Treatment Plant/staff	16-July-2022		
66.	Shi	Guanghua				

67.	Han	Qizheng				
68.	Bai /13/	Xiaofen	Local Stakeholders/ Residents	11-July-2022	Local Stakeholder Consultation issues, Local environment impact	Tong Dezheng Du Wenjun
69.	Dong	Jianian		11-July-2022		
70.	Liang	Hongyuan		11-July-2022		
71.	Deng	Tianyuan		12-July-2022		
72.	Cao	Jingyi		13-July-2022		
73.	Deng	Bowen		13-July-2022		
74.	Zhu	Pengpai		14-July-2022		
75.	Ma	Haoran		14-July-2022		
76.	Luo	Zhishang		14-July-2022		
77.	Lv	Feixing		15-July-2022		
78.	Meng	Shaoqi		15-July-2022		
79.	Cao	Yada		15-July-2022		
80.	Liang	Zixuan		15-July-2022		
81.	Zhu	Xiangyang		16-July-2022		
82.	Li	Le		16-July-2022		
83.	Wu	Haoran		16-July-2022		
84.	Zhao /13/	Tianbao	Local officer /Guangdong Provincial Ecological Environment Bureau	11-July-2022	Baseline Scenario Local Stakeholder Consultation issues, SDG impacts, Inputs, Grievances mechanism, Local legislation to swine and biogas	Tong Dezheng Du Wenjun
85.	Zhang	Xiufeng	Local officer/ Department of Housing and Urban-Rural Development of Guangdong Province			
86.	Wang /16/	Xuyang	Profit Carbon Environmental Energy Technology (Shanghai) Co.,	11-July-2022~16-July-2022	Ex-ante and monitoring parameters, JPM and ER, IRR, NPV editable issues	Tong Dezheng Du Wenjun

			Ltd./ Senior Manager			
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2.4 Site Inspections

The joint validation and verification site inspection was conducted on 11-July-2022~16-July-2022. A ground inspection of the project was conducted during the site visit and the joint validation and VVB interviewed representatives as listed in section 2.3.

During the site inspection, the project site was inspected and documents evidence were checked, details as following table,

Duration of on-site inspection: 11-July-2022~16-July-2022				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening meeting Interview with PP, local officers, consultant representatives	Office in Yunshui Guangdong Environmental Protection Co., Ltd. in Zhangjiang City, Guangdong Province, P. R. China	11-July-2022	Tong Dezheng Du Wenjun
2	On-site inspection Interview with representatives of Operation Staffs of the 16 plants, local residents	16 treatment plants in Project Area in Guangdong Province, P. R. China	11-July-2022~16-July-2022	Tong Dezheng Du Wenjun
3	Documents check	Project Area in Guangdong Province, P. R. China	11-July-2022~16-July-2022	Tong Dezheng Du Wenjun
4	Finding Summary	Project Area in Shanwei City, Guangdong Province, P. R. China	16-July-2022	Tong Dezheng Du Wenjun
5	Close Meeting	Project Area in Shanwei City, Guangdong Province, P. R. China	16-July-2022	Tong Dezheng Du Wenjun

2.5 Resolution of Findings

Material discrepancies identified in the course of the validation and verification are addressed either as CARs, CLs or FARs.

A Corrective Action Request (CAR) is established where:

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;
- The VCS Standard Version 4.3 requirements have not been met;
- There is a risk that the emission reductions cannot be monitored or calculated.

A Clarification Request (CL) will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

A Forward Action Request (FAR) will be issued when certain issues related to project implementation should be reviewed during the next verification.

A detailed list of the CARs CLs and FAR raised and discussed in the course of this validation and verification is included in Appendix 4 of this report.

In the course of the validation 32 Corrective Action Requests (CARs), 10 Clarification Requests (CLs) were raised and successfully closed. The assessment is included in the report.

2.5.1 Forward Action Requests

This is the joint validation and 1st VCS verification, thus there is no FAR raised previously.

3 VALIDATION FINDINGS

3.1 Project Details

- Project type

Through the onsite visit, interviewing the project developer and reviewing the project description/1/, it was confirmed that the project is a wastewater treatment project located in Guangdong Province, P.R China including 16 wastewater treatment plants, of which the main purpose is to reduce environmental pollution and destroy methane emissions from the open anaerobic lagoons in baseline scenario, the best available low-cost solution for wastewater treatment.

The project activity introduces 16 wastewater treatment plants to using the same treatment process (A²O+MBR) instead of the residents' domestic wastewater would have been treated through a series of deep open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the wastewater, aerobic wastewater treatment plants produce essentially no methane emissions during the entire process of wastewater treatment, which has been verified by on-site inspection, and checking the related documentations, interview with the project implementer.

Therefore, it was confirmed that the sectoral scope is Scope 13 Waste handling and disposal as per the UNFCCC Standard “Applicability of sectoral scopes version 01.0”/52/.

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

- Technologies and measures implemented:

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

The project is implemented by Yunshui Guangdong Environmental Protection Co., Ltd. which aims to introduce wastewater treatment technology located in Guangdong Province, P.R China including 16 wastewater treatment plants, of which the main purpose is to reduce environmental pollution and destroy methane emissions from the open anaerobic lagoons in baseline scenario, the best available low-cost solution for wastewater treatment. The wastewater is composed of residents' domestic wastewater within the service area. In the project scenario, the maximum design influent flow is 175,150 m³/d, the influent COD concentration are within range of 300mg/L to 550 mg/L and effluent COD concentration is 40 mg/L. An aerobic biological treatment technology, which includes pre-treatment process, secondary biological treatment process, tertiary deep treatment process and sludge treatment process is used by the project activity which has been confirmed by site inspection and checking the Feasibility Study Report (FSR) of the project/5/.

The technology is confirmed by site inspection and checking the FSR/5/, General design and construction contract/10/, Equipment purchase contracts/9/, Technical agreement of main equipment/11/ and Technical flow chart/17/.

The project activity introduces 16 wastewater treatment plants to using the same treatment process (A²O+MBR) instead of the residents' domestic wastewater would have been treated through a series of deep open anaerobic lagoons in baseline scenario to achieve the harmlessness and ecological utilization of the wastewater, aerobic wastewater treatment plants produce essentially no methane emissions

during the entire process of wastewater treatment, which has been verified by on-site inspection, and checking the related documentations, interview with the project implementer.

The manufacturers of the equipment installed has been added to Section 1.11 of the JPM, the name is verified as correct by checking the Equipment purchase contracts/9/. The project constructed aerobic wastewater treatment plant to treat wastewater from towns in 16 regions of Guangdong Province. All the 16 wastewater treatment plants use the same aerobic treatment process (A2O+MBR), and the treatment capacity of 16 wastewater treatment plants has been added to Section 1.11 of the JPM which has been verified as correct and actual by checking the Technical agreement of main equipment/11/.

Open anaerobic lagoons were used to treat the domestic wastewater in the 16 rural areas in the baseline scenario. Each anaerobic lagoon has different service capacity, which is determined by the amount of wastewater, type (domestic or industrial) and future trend. Via checking the feasibility study report/5/ of the project, VVB confirmed that water consumption and wastewater type of the 16 rural areas remains stable¹ which can ensure that the maximum designed capacity of the wastewater treated is the same under the baseline and the project scenario. Detailed information of the open anaerobic lagoons was added in Section 1.11 of the JPM that have been verified as correct and reasonable by checking the FSR/5/ and baseline survey report/13/.

The detailed parameters, such as depth, location, retention time, and volume of the 16 open anaerobic lagoons have been added to section 1.11 of the revised JPM that have been verified as correct and reasonable by checking the FSR/5/ and baseline survey report/13/.

Via checking the Sludge Disposal Letter Issued by Guangdong Housing and Urban-Rural Development Bureau/14/, VVB confirmed that the sludge generated should be dried under controlled and aerobic conditions, and then sent to the landfills with methane recovery for disposal respectively. Even in the baseline scenario, through checking the Baseline Survey Report/13/, it is confirmed that the sludge was treated in the same way as the project scenario. The landfills are not included in the project boundary, and they are not associated facilities of the project. The Sludge Landfill Contracts/73/ signed between the project owner and the landfills have been checked and verified the above demonstration.

The technology employed is environmentally safe and sound as well as state of the art. Via checking the Business License/4/of PP, General design and construction contract/10/ and Equipment purchase contracts/9/, it is verified that project owner invested in purchasing the equipment for all the treatment plants and owned all the plants. By implementing the project, it has provided an opportunity for local community to generate steady and continual income for their livelihood.

The project is applicable to the applied CDM Methodology AM0080 “Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater” (Version 01)/42/.

¹ According to the 7th National Population Census Bulletin of Guangdong Province(<http://stats.gd.gov.cn/attachment/0/421/421375/3284461.pdf>), the rural population in Guangdong Province has remained relatively stable from 2010 to 2020. So the population of the 16 regions where the project is located was stable during this period and is likely to remain stable for a considerable period in the future. It can be inferred that the water consumption of residents will also remain stable.

The expected total emission reduction of the Project in the crediting periods of 10 years (from 03-September-2020 to 02-September-2030) is 830,420 tCO₂e, and the annual emission reduction is estimated to be 83,042 tCO₂e.

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

- Eligibility of the project:

The PP has described and justified how the project is eligible under the scope of the VCS Program in Joint-PD-MR as per the section 2.1.1 of VCS Standard Version 4.3. The assessment is provided as below,

1. The project activity generates GHG emission reductions including CH₄ which belong to the six Kyoto Protocol greenhouse gases.
2. “The scope of the VCS Program excludes projects that can reasonably be assumed to have generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction.” Via checking the Joint-PD-MR/1/ of the project, it is verified that the project is implemented to reduce methane emissions by replacing open anaerobic ponds in the baseline scenario with the aerobic wastewater treatment plant in Guangdong Province, and the additionality is verified as actual, thus there is no assumption of having generated GHG emissions primarily for the purpose of their subsequent reduction, removal or destruction for this project.
3. The VCS Program also excludes the following project activities under the circumstances indicated in Table 1 of section 2.1.1 of VCS Standard Version 4.3, via checking all the excluded project activities in the table, it is verified that this project type is not excluded by the scope of VCS program.

Furthermore, based on the requirement of section 3.1 of the VCS-Standard (version 4.3)/51/, PP has analyzed that the project is in line with the General project Requirements. The project is applicable to the applied CDM Methodology AM0080 “Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater” (Version 01)/42/, hence it fulfills with the General project Requirements as requested in the section 3.1 of the VCS-Standard (version 4.3)/51/.

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

- Project design, including eligibility criteria for grouped projects

The project activity involves the construction and operation 16 wastewater treatment plants in Guangdong Province owned by Yunshui Guangdong Environmental Protection Co., Ltd. Then the 16 wastewater treatment plants belongs to multiple project activity instances.

This project is not a grouped project.

- Project proponent and other entities involved in the project

The project proponent (Yunshui Guangdong Environmental Protection Co., Ltd.), and the contact information reported in section 1.5 of the VCS Joint-PD-MR/1/ have been confirmed to be correct through

checking the business license of the company/4/, Approval of the project/8/, Approval of EIA/7/ and interviewing with the PP representative/11/ through on-site visit.

The other entities involved in the Project (Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.) and the contact information reported in section 1.6 of the VCS Joint-PD-MR have been confirmed to be correct through checking the business license of the Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd./4/ and interviewing the representative of this company/15/ during the on-site visit.

- Ownership

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

Via checking the National legal approvals Approval of the project which covered all the 16 plants as a whole project activity/8/, and Approval of the Environmental Impact Assessment (EIA) of the project which covered all the 16 plants as a whole project activity/7/, Equipment purchase contracts/9/ and the business license of the Yunshui Guangdong Environmental Protection Co., Ltd./4/, it is verified that the PP has the legal right to control and operate the project activity. Thus, it is confirmed that the project owner has the ownership of the project and carbon credits generated.

- Project start date

The project start date is 03-September-2020 which is verified as the date on which the project began generating GHG emission reductions or removals as per the concept in VCS Standard Version 4.3/51/.

Via checking the operation log/16/, it is verified that 03-September-2020 is the date when earliest wastewater treatment plant (Xinyi City Dingbao Town wastewater treatment Plant) began put into operation, hence the start date is correct and in line with the VCS Standard Version 4.3/51/.

- Project crediting period

For the VCS crediting period, PP has chosen 10 years fixed crediting period started from 03-September-2020 to 02-September-2030 which is in line with the concept for crediting period in section 3.8.2 of the VCS Standard Version 4.3.

- Project scale and estimated GHG emission reductions or removals

The average annual ERs of the project are 83,042 tCO₂e, which is lower than the threshold of large-projects (300,000 tCO₂e per year). Therefore the project falls in the category of “Project” as per definition in VCS Standard Version 4.3/51/. And the estimated total Estimated GHG Emission Reductions or Removals during the 10 years of VCS fixed crediting period (03-September-2020 to 02-September-2030) is 830,420 tCO₂e.

- Project location

The project site is located at Guangdong Province, P. R. China. There are 16 aerobic wastewater treatment plants involved in the project. Details of the plants’ location are given in table 3-1 below:

Table 3-1: Project Location

Item	Project Location		
Host Country	China		
Region:	Guangdong Province		
Geographical Coordinates			
Plant Name	Located City	North latitude	East longitude
Xiaqiao Town wastewater Treatment Plant	Zhanjiang	20 ° 26'55.0"N	110 ° 06'40.8"E
Qujie Town wastewater Treatment Plant	Zhanjiang	20 ° 28'47.3"N	110 ° 19'23.5"E
Xinyi City Dingbao Town wastewater treatment Plant	Xinyi	22 ° 18'29.7"N	110 ° 58'08.8"E
Xinyi City Qianpai Town wastewater treatment Plant	Xinyi	22 ° 23'23.1"N	111 ° 15'03.3"E
Xianqiao South Wastewater Treatment Plant	Jieyang	23 ° 28'56.3"N	116 ° 21'24.0"E
Qiankeng Town North wastewater Plant	Jieyang	23 ° 23' 33.28" N	116 ° 00' 10.59" E
Shangsha Town wastewater Treatment Plant	Jieyang	23 ° 27'60.0"N	115 ° 41'44.8"E
Baita Town wastewater Treatment Plant	Jieyang	23 ° 33'04.5"N	116 ° 12'36.8"E
Luoding Fourth Domestic wastewater Treatment Plant	Luoding	22 ° 46'20.8"N	111 ° 32'43.4"E
Shitan Town wastewater Treatment Plant	Qingyuan	24 ° 06'41.1"N	112 ° 46'30.5"E
Litan Town wastewater Treatment Plant	Qingyuan	24 ° 03'15.2"N	112 ° 49'38.3"E
jiulong Town wastewater Treatment Plant	Yingde	24 ° 8'6.54"N	112 ° 55'2.61"E
Shakou Town wastewater Treatment Plant	Yingde	24 ° 25'32.7"N	113 ° 31'16.1"E
Bomei Town wastewater Treatment Plant	Shanwei	22 ° 55'44.10"N	115 ° 46'05.73"E
Nantang Town wastewater Treatment Plant	Shanwei	22 ° 55'32.4"N	115 ° 54'14.4"E
Chikeng Town wastewater Treatment Plant	Shanwei	22 ° 51'04.55"N	115 ° 28'11.26"E

The project location has been clearly provided in section 1.12 of the JPM and the detailed coordinates of the 16 aerobic wastewater treatment plants have been provided respectively which have also been verified by site inspection with GPS device and checking the map and the information is verified as correct.

• Conditions prior to project initiation

Via checking the Joint-PD-MR/1/, it is confirmed that the scenario existing prior to the implementation of the project is the rural residents' domestic wastewater in the project site is treated by the existing local open anaerobic lagoons and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity, which has been confirmed during the site interview with PP and on-site checking the baseline survey report/13/. Thus it is verified that the scenario existing prior to the implementation of the project is reasonable and correct.

And via site inspection and checking the related equipment purchase contracts/9/ and General design and construction contract/10/, it is verified that all the equipment involved in aerobic wastewater treatment plants covered by the project were newly built and there was no existing aerobic wastewater treatment system prior to the project activity hence no existing equipment in baseline scenario.

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

- Project compliance with applicable laws, statutes and other regulatory frameworks

The Joint-PD-MR has stated that the project is in the field of waste handling, this industry is confirmed as in line with the laws and regulations/71/ as listed in the Joint-PD-MR.

Also the project is legally approved by Local government by checking the EIA approval/7/, which means that the project is in line with the national and local laws and regulations based on the local expertise of the VVB. And as stated in the Joint-PD-MR/1/ and confirmed by interview with local officer/12/, CTI verified that the project will be subject to regular inspection by local government during the implementation period to ensure continuous compliance.

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

- Participation under other GHG programs:

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

The project has neither been registered nor seeking registration under any other GHG programs which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website. It is verified that the project is seeking registration only in VCS program/55/.

-Rejection by other GHG programs

The project has neither been rejected by any other GHG programs which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website.

- Other forms of credit:

-Emissions trading programs and other binding limits

The project proponent is not part of any emission trading program which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website. The net GHG emission reductions during this monitoring period from the project was not used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website, it is verified that the implementation of the project is consistent with the description in the Joint-PD-MR and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 03-September-2020 to 30-June-2022 which

has been confirmed by checking the Declaration of no double counting and not involved in other GHG scheme/29/.

Besides, based on VVB's local expertise, China has a national emissions trading scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO₂e/year which has been verified in the public website/58/, and it is confirmed that the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner by checking the enforced company list in public information/59/. Hence, it is confirmed that the emission reductions will not be double counted.

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

Via interview with the project developer/11/ and based on above assessment, it is confirmed that the project has not created any other form of environmental credit.

• Sustainable development contributions

Via on-site inspection, checking the evidence provided as below and interview with the project implementer, CTI verified that the project contributes the sustainable development through the following aspects:

1. The project ensure availability and sustainable management of water and sanitation for more people (Goal 6 of UN SDG) – verified by checking the Daily operation record of each treatment plant/22/ and Emission Reduction Calculation sheet/2/, it is confirmed that 90,062,261 m³ of wastewater is treated by the project during this monitoring period, which treated by 16 aerobic wastewater treatment plants that reduce water pollution and increase the proportion of wastewater treatment nationwide, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable;
2. The project activity creates Temporary and permanent job opportunities (Goal 8 of UN SDG) – verified by interview with staffs and checking the Labor Contracts/30/ and monthly payroll/31/, it is confirmed that 240 long-term job opportunities (120 females and 120 males) have been provided during this monitoring period, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable;
3. Sequester greenhouse gas and mitigate climate changes (Goal 13 of UN SDG) – 110,002 tCO₂e GHG emission reductions have been achieved, which is verified by checking the Emission Reduction Calculation sheet/2/, hence the contribution to this SDG has been confirmed and the provisions for monitoring and reporting this goal is verified as reasonable.

• Additional information relevant to the project, including:

-Leakage management for AFOLU projects

According to the paragraph 35 of applied methodology, no leakage is considered in this methodology.

-Commercially sensitive information

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

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

CL 01, CL 02, CAR 01, CAR 02, CAR 03 and CAR 04 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.2 Participation under Other GHG Programs

The project has neither been registered nor seeking registration under any other GHG programs which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website. It is verified that the project is seeking registration only in VCS program/55/.

3.3 Safeguards

3.3.1 No Net Harm

In China, an Environmental Impacts Assessment is required according to Chinese legislation. The EIA of the project which covered all the 16 plants as a whole project activity was designed by Nanjing Xiangtiange Environmental Protection Technology Co., Ltd./6/ and approved by Guangdong Provincial Department of Ecology and Environment on 18-April-2020/7/. The analysis of the environmental impacts of the project activity is sufficiently described according to EIA report/6/. The assessment is as below,

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

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

As per the approval of EIA/7/, it stated that the inspectors from the local Environmental Protection Bureau have to carry out monitoring work for the environmental impact arisen from the project activity during project commissioning periodically. Via interview with the local officers from local Environmental Protection Bureau/13/, CTI confirmed that they are satisfactory with the environmental protection and recovery work carried out by the project owner. The local Environmental Protection Bureau also did not receive any public comment on the project activity during this monitoring period.

During the on-site interview, the local residents/13/ were interviewed if there was critical impact to their living environment. It is verified that the project activity does not cause adverse effect to their daily life.

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

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

Refer to section 3.3.3 below for detail assessment of the environmental impacts.

3.3.2 Local Stakeholder Consultation

Local stakeholder consultation prior the project started construction

A stakeholder consultation meeting was carried out by the project developer on 02-May-2019 which was prior to the start date of the construction.

Multiple measures have been taken to ensure that the stakeholders from all the 16 plants were invited to the consultation process,

Firstly, posters of physical meetings were posted at the gates of the 16-wastewater treatment plants. The content of the poster includes key information of the project and the consultation meeting (location, date and purpose) which has been confirmed by checking the LSC records.

Secondly, there are no barriers to go to the meeting place, which is located in the conference room of Yunshui Guangdong Environmental Protection Co., Ltd. The transportation in Guangdong Province is convenient. The local public transit network covers bus and train, the stakeholders can choose the most suitable transportation mode.

Thirdly, stakeholders involved in the 16 plants were also invited by emails and telephones. The above measures can ensure all the stakeholders involved in the 16 plants can be invited.

Finally, grievance mechanism of the project was established. The stakeholders who cannot participate the consultation meeting can contact PP through email, telephone or the grievance book. The contact information of PP was announced to the stakeholders through the posters and emails before the consultation meeting.

Thus based on above different approaches, VVB confirmed that the consultation process ensured that the stakeholders from all the 16 plants have been included.

During the meeting, total 30 participants who accepted the invitation, attended the meeting and returned the questionnaire. The stakeholders' background information, survey process, and final comments and response from PP were summarized and recorded in the Joint-PD-MR, Section 2.2.

Via checking the meeting records and 30 filled questionnaires/27/, it is verified that all attendees were invited to express their comments and most respondents knew or heard about the Project. Most of them are supportive of the project construction, and think the Project will bring more benefit than loss. Only some feedback and comments were received, however, by checking the meeting records and 30 filled questionnaires/27/, CTI confirmed that these feedbacks mainly focus on the questions of project technology, project mechanism operation and the environmental impact. Prompt response was made by PP during the meeting and the feedback and response were accepted by local stakeholders. And the survey shows that many local stakeholders think the Project will help improve the life of local people and promote local economic development without any adverse environmental impact and there were no comments on project design and monitoring methods.

Finally, it is verified that no negative comments raised from local stakeholders by checking the meeting records and 30 filled questionnaires/27/ and thus no need to change the project design based on the stakeholder inputs.

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

During the implementation stage of this monitoring period, via checking the local communication survey records/28/ and interview with the local officer/12/ and local residents/13/ during site visit, it is confirmed that the PP has conducted follow-up interviews and ongoing communication with local stakeholders to collect any comments or inputs to the project implementation. Based on the VVB's local expertise, CTI confirmed that the local government agencies and competent authorities will conduct spot checks on the implementation of the project from time to time as per the request from the local government's regulations.

Moreover, the project owner carried out a questionnaire survey for the local stakeholder to collect the relevant comments and suggestions from 16-September-2020 to 26-September-2020 during this 1st monitoring period, the questionnaires were distributed by the PP randomly in the surrounding areas of the 16 plants. There was a total of 6 questions in the questionnaire and it can be finished within 10 minutes. The completed questionnaires were collected by the PP immediately. Any other questions or suggestions about the project were also replied at the same time. And project proponent put up public announcements at the villages near the project site about the survey including general information about the introduction of project, the date and the purpose of the questionnaire survey as well as the project proponent's phone number and email address from 05-August-2020 to 10-August-2020, the purpose of this public announcements is to enable residents around the project to participate in the questionnaire survey. The content of the announcements mainly includes key information of the project, the way to participate the survey, the time period of the survey and contact information of the PP. The local residents who missed the questionnaire survey can contact the PP for further plan of the project which is confirmed by interview with the local stakeholders.

320 questionnaires were distributed during the survey and all questionnaires were collected. Via checking the 320 filled questionnaires/28/, interview with the local officer and local stakeholders during site visit, it is verified that nearly all the respondents believe that the Project will not have any negative environmental impact. It is verified that all local stakeholders who participated the survey were satisfied with the implementation of the project which has been confirmed by site interview with local stakeholders.

The local officers from Environment Protection Bureau/13/ has confirmed that the project was under supervised and the implementation of the project is in line with the local environment protection regulations and EIA/6/. And via checking the 320 filled questionnaires/28/, it is confirmed that no other negative impacts considered by local stakeholder to their local life.

Via interview with the local officer/13/ and local residents/14/ during site visit, it is verified that there were no comments and issues from the local stakeholders during the implementation period and the project passed all the periodic spot checks by local government. Hence there is no need to change the project design based on the stakeholder inputs.

Furthermore, via site inspection, CTI confirmed that 16 grievance books were put in the communication room at the main door of each wastewater treatment plant so that to collect the grievances or comments from local stakeholders anytime, and via checking all the books during site visit, CTI verified that there was no any grievances or comments received during this monitoring period.

CL 03 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.3.3 Environmental Impact

In China, an Environmental Impacts Assessment is required according to Chinese legislation. The EIA was designed by Nanjing Xiangtiange Environmental Protection Technology Co., Ltd./6/ and approved by Guangdong Provincial Department of Ecology and Environment on 18-April-2020/7/. The analysis of the environmental impacts of the project activity is sufficiently described according to EIA report/6/. The assessment is as below,

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

The environmental impacts of the project were sufficiently assessed by means of an Environmental Impact Assessment (EIA) study report according to the Chinese laws & regulations such as “Environmental Protection Law of P.R. China”/71/ and “Law of the People's Republic of China on the Environmental Impact Assessment”/71/. Every aspect of environmental impact has been considered in the EIA report with corresponding measures during project construction and operation.

During the construction period, via interview with the local officer from local Environmental Protection Bureau/13/, it is confirmed that the potential environmental impacts have been sufficiently identified for the construction period, such as air pollution, wastewater, noise and solid waste etc. The conclusion of the analysis has been described in the Joint-PD-MR as per the EIA report/6/ and the related mitigation measures have been listed as per the approval of EIA report/7/. Due to the project has been implemented during the site inspection, it is confirmed that the impact during the construction period has been solved and no significant environmental impacts are expected from the project activity.

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

Via interview with the local officers from local Environmental Protection Bureau/13/, it is confirmed that they are satisfactory with the environmental protection and recovery work carried out by the project owner. The Environmental Protection Bureau also did not receive any public comment on the project activity after the implementation of the project.

CL 04 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.3.4 Public Comments

The project sought the registration with the VCS Program, according to VCS requirements the Project Description was submitted for public comment period. The project was allocated with VCS ID 2938. The public comment period started on 05-April-2022 and ended on 05-May-2022 (<https://registry.verra.org/app/projectDetail/VCS/2938>).

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

CAR 05 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.3.5 AFOLU-Specific Safeguards

N/A

3.4 Application of Methodology

3.4.1 Title and Reference

The approved consolidated methodology applied in the project activity is AM0080 – “Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater” (version 01)/42/.

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

Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)/43/

Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)/44/

Tool 07: Tool to calculate the emission factor for an electricity system (version 07.0)/45/

Tool 24 Common practice (Version 03.1)/46/

3.4.2 Applicability

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

Table 3-1 Assessment of Applicability conditions of AM0080 (version 01).

No.	Applicability conditions	Validation Assessment	Conclusion
1	This methodology is applicable to project activities that implement a new aerobic wastewater treatment plant for the treatment of domestic and/or industrial wastewater. The sludge produced in the aerobic wastewater treatment plant in the project activity is either: (1) Treated in the same way as the sludge that would have been produced in the anaerobic open lagoons system in the baseline scenario would have been treated. This includes one of the following two options: (i) the sludge is dumped or left to decay; or (ii) the sludge is dried under controlled and	Via site inspection and checking the FSR/5/, related equipment purchase contracts/9/ and General design and construction contract/10/, CTI verified that this project activity introduces 16 aerobic wastewater treatment plant to treat the rural residents' domestic wastewater in 16 regions of Guangdong Province to avoid methane emissions generated in the baseline uncovered anaerobic lagoons. The previous 16 existing anaerobic open lagoons were replaced by the	Applicable

No.	Applicability conditions	Validation Assessment	Conclusion
	aerobic conditions, and then disposed to a landfill with methane recovery or used in soil application (2) Treated in a new anaerobic digester, with the biogas extracted from the anaerobic digester being flared and/or used to generate electricity and/or heat. The residues from the anaerobic digester are dehydrated, limed and stored before final disposal in a controlled landfill.	newly built aerobic wastewater treatment systems as per the FSR/5/. The sludge generated in this baseline scenarios was dried under controlled and aerobic conditions, and then sent to landfills with methane recovery for disposal (S2) respectively confirmed via checking the baseline survey report/13/. Via site inspection and checking the Sludge Disposal Letter/14/, CTI confirmed that the sludge generated in this project scenario is also dried under controlled and aerobic conditions, and then sent to the same landfills with methane recovery for disposal (S2) respectively. Therefore, the sludge produced in the aerobic wastewater treatment plants in the project activity is treated in the same way as the sludge that would have been produced in the anaerobic open lagoons. They are all dried under controlled and aerobic conditions, and then sent to the same landfills with methane recovery for disposal (S2). As above, each project activity instance complies with condition 1 of AM0080, v.01 and baseline S2.	
2	The project activity either replaces an existing anaerobic open lagoons system, with or without conversion of the sludge treatment system, or is an alternative to a new to be built anaerobic open lagoons system;	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that this project activity replaces existing anaerobic open lagoons systems, without conversion of the sludge treatment system. 16 anaerobic open lagoons systems were existed in the baseline all 16 wastewater treatment plants are newly built in the project. Hence this criteria is applicable for this project activity.	Applicable
3	Loading in the wastewater streams has to be high enough to ensure that the existing or new to be built anaerobic open lagoons system develops an anaerobic bottom layer	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that existing anaerobic open lagoons	Applicable

No.	Applicability conditions	Validation Assessment	Conclusion
	and that algal oxygen production can be ruled out;	systems in the baseline scenario are total 16 open stabilization lagoons with depth all greater than 5 m. In addition, via checking the Stabilization Lagoons Design Specification (CJJ/T54-93) which is a Chinese industry standard /33/, CTI confirmed that for all the open stabilization lagoons in baseline, as per the mentioned Chinese industry standard, the entire open pond is completely in an anaerobic environment at this depth level, anaerobic open lagoons system can develop an anaerobic bottom layer and that algal oxygen production can be ruled out. Hence this criteria is applicable for this project activity.	
4	The average depth of the existing or new to be built anaerobic open lagoons system is at least 1 meter. In case of an existing anaerobic open lagoons system in the baseline scenario, the depth of the lagoons should be verified based on historical data available for one year before the implementation of the project activity. In case of a new to be built anaerobic open lagoons system, the depth of the lagoons should be determined following the guidance provided in Step 1 of the section “Procedure for the identification of the most plausible baseline scenario and assessment of additionality”	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that the average depth of the existing anaerobic open lagoons system is at least 1 meter. CTI confirmed that the baseline survey report/13/ which can show the depth of lagoons was taken from baseline survey report/13/, the survey was conducted from 01-January-2018 to 31-December-2018, which is verified as the historical data available for one year before the implementation of the project activity. Hence this criteria is applicable for this project activity.	Applicable
5	The residence time of the organic matter in the anaerobic open lagoons system is at least 30 days. In case of an existing anaerobic open lagoons system in the baseline scenario, the residence time of the organic matter in the lagoon should be verified based on historical data available for one year before the implementation of the project activity. In case of a new to be built anaerobic open lagoons system, the residence time of organic matter in the lagoons should be determined following the	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that the average depth of the existing anaerobic open lagoons system is about one year which is higher than 30 days. CTI confirmed that the baseline survey report/13/ which can show the depth of lagoons was taken from baseline survey report/13/, the survey was conducted from 01-	Applicable

No.	Applicability conditions	Validation Assessment	Conclusion
	guidance provided in Step 1 of the section "Procedure for the identification of the most plausible baseline scenario and assessment of additionality"	January-2018 to 31-December-2018, which is verified as the historical data available for one year before the implementation of the project activity. Hence this criteria is applicable for this project activity.	
6	The wastewater would have been treated in an existing (W3) or new to be built (W6) anaerobic open lagoons system under clearly anaerobic conditions and without methane recovery and flaring;	Via site inspection and checking the FSR/5/ and baseline survey report/13/, wastewater service treatment agreement/15/, CTI verified that the wastewater had been treated in an existing (W3) anaerobic open lagoons system under clearly anaerobic conditions and without methane recovery and flaring. Hence this criteria is applicable for this project activity.	Applicable
7	The sludge that would have been produced in the baseline lagoons system would have been dumped or left to decay (S1), or dried under controlled and aerobic conditions and then disposed to a landfill with methane recovery or used in soil application (S2);	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that the sludge generated in this baseline scenario is treated in the same way as in the project scenario, where it is dried under controlled conditions and then sent to a landfill with methane recovery for disposal (S2). Hence this criteria is applicable for this project activity.	N/A
8	The electricity produced with biogas in the project scenario, if any, would have been produced using fossil fuels in a captive power plant (E1), or obtained from the grid (E2);	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI confirmed that biogas power generation does not exist in the project scenario. Hence, this criteria is N/A.	N/A
9	The heat produced with biogas in the project scenario, if any, would have been produced using fossil fuels in a captive cogeneration power plant (H1), or using fossil fuels in a boiler (H2).	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI confirmed that biogas heat generation does not exist in the project scenario. Hence, this criteria is N/A.	N/A
Conclusion: Methodology AM0080 (Version 01) is applicable to the project activity.			

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

Table 3-2 Assessment of Applicability conditions of methodological tool

Tool	Criteria	Validation Assessment	Conclusion
(a) Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)	The tool is applicable to all types of proposed project activities. However, in some cases, methodologies referring to this tool may require adjustments or additional explanations as per the guidance in the respective methodologies. This could include, inter alia, a listing of relevant alternative scenarios that should be considered in Step 1, any relevant types of barriers other than those presented in this tool and guidance on how common practice should be established.	The tool is applicable to all types of proposed project activities, and in section 15 of the applied methodology, it requires project proponents determine the most plausible baseline scenario through the use of the “Combined tool to determine the baseline scenario and demonstrate additionality”. Thus this tool is applicable to the project.	Applicable
Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)	If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the	Via site inspection, it is confirmed that the electricity consumption of the project will be supplied by the SCPG (South China Power Grid), which falls under scenario A. Therefore, emissions related to electricity consumption need to be calculated based on Tool 05.	Applicable

Tool	Criteria	Validation Assessment	Conclusion
	electricity consumer. The captive power plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.		
	This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	N/A	Applicable
	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO₂ emissions.	Via checking the ER calculation process, it is confirmed that Tool 05 is only used to calculate project emissions of electricity consumption supplied by SCPG. No captive renewable power generation technologies will be installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage.	Applicable
Tool 07 Tool to calculate the emission factor for an electricity system (version 03.0)	This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a	As assessed above, the baseline scenario is open anaerobic lagoons system, and no electricity was used. Hence this criteria is N/A.	N/A

Tool	Criteria	Validation Assessment	Conclusion
	project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects).		
	Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in “Appendix 1: Procedures related to off-grid power generation” should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity.	Via site inspection, it is confirmed that the electricity consumption of the project will be supplied by the SCPG (South China Power Grid), hence the emission factor for the project electricity system will be calculated for grid power plants only as per this tool.	Applicable
	In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country.	Via site inspection, CTI confirmed that the project electricity system is located totally in Guangdong Province of China, which is not an Annex I country.	Applicable
	Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	Via site inspection, it is confirmed that the electricity consumption of the project will be supplied by the SCPG (South China Power Grid). As per requirements of this criterion, the value applied to the CO ₂ emission factor of biofuels were zero. The latest	Applicable

Tool	Criteria	Validation Assessment	Conclusion
		available emission factor of SCPG issued by China DNA on 29-December-2020/60/ was verified as applicable to calculate emission factor.	
Tool 24 Common practice (Version 03.1)	This methodological tool is applicable to project activities that apply the methodological tool “Tool for the demonstration and assessment of additionality”, the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality”, or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality.	As assessed above, the project applies the methodological tool “Combined tool to identify the baseline scenario and demonstrate additionality” for the demonstration of additionality, the project can use the common practice test for the demonstration of additionality. Hence this criteria is applicable for this project activity.	Applicable
	In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail.	Via checking the applied methodology, CTI confirmed that the methodology defines approaches for the conduction of the common practice test that are same to those described in this methodological tool. Hence this criteria is applicable for this project activity.	Applicable
Conclusion: All the relevant methodological tools are applicable to the project activity.			

CAR 06 and CAR 07 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.4.3 Project Boundary

The project boundary basically defines the physical and geographical boundary of the project facility and it is well defined in the Joint-PD-MR/1/ (section 3.3) according to AM0080 Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater (Version 01)/42/. The project boundary includes following,

Project boundary has been defined in the Joint-PD-MR according to the applied methodology AM0080/42/ is the existing baseline open lagoons and physical and geographic boundary of 16 wastewater treatment plants, which mainly includes the site and facilities for wastewater and sludge treated, sludge transportation, landfill for sludge landfill, the power plants connected to the grid (SCPG), which is verified by checking the FSR of the project/5/ and on-site inspection.

Via site inspection and checking the FSR/5/ and the technical flow chart in the project site/17/, it is verified that project boundary is clearly defined in the Joint-PD-MR/1/ as per the methodology/42/.

Emissions sources included in the project boundary have been appropriately included in the Joint-PD-MR. CH₄ due to emissions from the wastewater treatment and CO₂ emissions from transportation of sludge are covered for baseline scenario and the project scenario has emissions due to CO₂ emissions from on-site electricity use, CO₂ emissions from transportation of sludge and CH₄ emissions from the wastewater treatment processes.

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

CAR 08 and CL 05 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.4.4 Baseline Scenario

The PP has applied an approved baseline and methodology AM0080, version 01 which is approved under CDM scheme.

The JPM applies the stepwise approach as given in the AM0080/42/ and "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/43/.

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

Step 1a: Define alternative scenarios to the project activity

The plausible alternative scenarios for wastewater and sludge treatment should be chosen so as to meet the water and sludge quality standards defined in the applicable legislation. Plausible alternative scenarios for the treatment of wastewater (W) should be determined.

The identified alternatives as provided in the methodology are assessed by validation team as below

Alternatives	VVB Assessment
W1: Direct release of wastewaters to a nearby water body;	Via site interview with local officers and checking the Environmental Protection Law of the People's Republic of China/71/, CTI confirmed that direct release of wastewater to a nearby water body is forbidden. This alternative is ruled out.
W2: Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);	Via site interview with local officers and searching the public information based on local expertise, CTI confirmed that aerobic treatment processes, such as activated sludge and biofilm, is complying with national government legislation on water quality and water discharge. This alternative is realistic for this step.
W3: Existing anaerobic open lagoons system without methane recovery and flaring;	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI confirmed that the anaerobic lagoons in baseline is open, without methane recovery and flaring system. Furthermore, via checking the FSR/5/ and baseline survey report/13/, it is confirmed that the 16 plants' wastewater amount

	treated and COD (influent and effluent) in the project scenario are the same with that of the baseline scenario and the water consumption and wastewater type of the 16 rural areas remains stable² which is also confirmed in the FSR/5/. Based on the local expertise of VVB and searching the national standard of wastewater treatment, VVB confirmed that the treated wastewater should meet Level A standard (50mg/L) of the "Emission Standard for Pollutants from Municipal Wastewater Treatment Plants (GB18918-2002)/74/ and the level 1 standard of the Guangdong local standards "water pollutants emission limits (DB44/26-2001)" (40mg/L) regardless of what treatment technology. Therefore, VVB confirmed that the analysis for the baseline scenario is reasonable and 16 anaerobic open lagoons that existed in the pre-project scenario complied with the applicable water quality/discharge standards. This alternative is considered as an alternative.
W4: Existing anaerobic open lagoons system with methane recovery and flaring;	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI confirmed that the anaerobic lagoons in baseline is open, without methane recovery and flaring system. This alternative is ruled out.
W5: Existing anaerobic open lagoons system with methane recovery and utilization for energy generation;	Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI confirmed that the anaerobic lagoons in baseline is open, without methane recovery and flaring system. This alternative is ruled out.
W6: New to be built anaerobic open lagoons system without methane recovery and flaring;	Via checking the national laws and regulation/71/, CTI confirmed that construction and operation of the open anaerobic lagoons is in line with the national laws and regulation and before the construction of the project, the residents' domestic wastewater is treated by the existing open anaerobic pond without methane recovery and flaring, so it is not necessary to build anaerobic open lagoons system. This alternative is ruled out.
W7: New to be built anaerobic open lagoons system with methane recovery and flaring;	Via checking the national laws and regulation/71/, CTI confirmed that construction and operation of the open anaerobic lagoons is in line with the national laws and regulation and before the construction of the project, the residents' domestic wastewater is treated by the existing open anaerobic pond without methane recovery and flaring, so it is not necessary to build anaerobic open lagoons system. This alternative is ruled out.
W8: New to be built anaerobic open lagoons system with methane recovery and utilization for energy generation;	Via checking the national laws and regulation/71/, CTI confirmed that construction and operation of the open anaerobic lagoons is in line with the national laws and regulation and before the construction of the project, the residents' domestic wastewater is

² According to the 7th National Population Census Bulletin of Guangdong Province(<http://stats.gd.gov.cn/attachment/0/421/421375/3284461.pdf>), the rural population in Guangdong Province has remained relatively stable from 2010 to 2020. So the population of the 16 regions where the project is located was stable during this period and is likely to remain stable for a considerable period in the future. It can be inferred that the water consumption of residents will also remain stable.

	treated by the existing open anaerobic pond without methane recovery and flaring, so it is not necessary to build anaerobic open lagoons system. This alternative is ruled out.
W9: Anaerobic digester without methane recovery and flaring;	Via checking “Technical Specifications for completely mixed anaerobic reaction tank in Wastewater Treatment” (HJ 2024-2012)/35/, CTI confirmed that anaerobic wastewater digesters are normally applied in small quantity industrial wastewater treatment units and anaerobic digestion reactors are generally suitable for treating organic wastewater with high concentration which is difficult to biodegrade, and the effluent generally cannot meet the current primary A standard for wastewater discharge (less than 40mg/L). However, the influents of 16 wastewater treatment plants are quite large, which is consistent of domestic wastewater. This alternative is ruled out.
W10: Anaerobic digester with methane recovery and flaring;	Via checking “Technical Specifications for completely mixed anaerobic reaction tank in Wastewater Treatment” (HJ 2024-2012)/35/, CTI confirmed that anaerobic wastewater digesters are normally applied in small quantity industrial wastewater treatment units and anaerobic digestion reactors are generally suitable for treating organic wastewater with high concentration which is difficult to biodegrade, and the effluent generally cannot meet the current primary A standard for wastewater discharge (less than 40mg/L). However, the influents of 16 wastewater treatment plants are quite large, which is consistent of domestic wastewater . This alternative is ruled out.
W11: Anaerobic digester with methane recovery and utilization for electricity or heat generation.	Via checking “Technical Specifications for completely mixed anaerobic reaction tank in Wastewater Treatment” (HJ 2024-2012)/35/, CTI confirmed that anaerobic wastewater digesters are normally applied in small quantity industrial wastewater treatment units and anaerobic digestion reactors are generally suitable for treating organic wastewater with high concentration which is difficult to biodegrade, and the effluent generally cannot meet the current primary A standard for wastewater discharge (less than 40mg/L). However, the influents of 16 wastewater treatment plants are quite large, which is consistent of domestic wastewater . This alternative is ruled out.
Plausible alternative scenarios for the treatment of sludge (S) have been determined as per the methodology and assessed as below,	
S1: The sludge would have been dumped or left to decay;	Via checking “Law of the P. R. China on the Prevention and Control of Environmental Pollution by Solid Waste”/71/, CTI confirmed that sludge is a waste product, which must be treated properly to prevent waste from having impact on the environment and the quality of life. This alternative is ruled out.
S2: The sludge would have been dried under controlled and	Via site inspection and checking the FSR of the project activity, and based on the Sludge Disposal Letter/14/, CTI confirmed that

aerobic conditions, with disposal in a landfill with methane recovery or with use in soil application;	the sludge from the project is dried under controlled and aerobic conditions, and then disposed to 16 landfills near to 16 treatment plants which with methane recovery devices. In addition, via checking “Law of the P. R. China on the Prevention and Control of Environmental Pollution by Solid Waste” /71/, CTI confirmed that the activity of solid wastes is ultimately placed in controlled landfills, which is in accordance with environmental protection requirements. This alternative is realistic for this step.
S3: Disposal of sludge in sludge pits under clearly anaerobic conditions;	Via checking “Law of the P. R. China on the Prevention and Control of Environmental Pollution by Solid Waste”/71/, CTI confirmed that sludge is a waste product, which must be treated properly to prevent waste from having impact on the environment and the quality of life. In addition, the anaerobic treatment of sludge in sludge pits is actually an incomplete treatment method. This alternative is ruled out.
S4: Land application of the sludge;	Via checking “Law of the P. R. China on the Prevention and Control of Environmental Pollution by Solid Waste”/71/, CTI confirmed that sludge is a waste product, which must be treated properly to prevent waste from having impact on the environment and the quality of life. Furthermore, considering COD concentration of wastewater influent and some of its industrial characteristics, land application of sludge is not suitable. This alternative is ruled out.
S5: Composting;	Based on the local expertise of VVB, CTI confirmed that composting requires expensive equipment and consumes a lot of manpower and management, and occupies a considerable amount of land. This alternative is ruled out.
S6: Mineralization;	Based on the local expertise of VVB, CTI confirmed that mineralization of sludge complies with the national legislation, and might be considered for treatment of sludge from W2 and W3 in the absence of the project activity. However, the sludge mineralization technology is not maturely developed both domestically and internationally and is too expensive to be used in industry. This alternative is ruled out.
S7: Disposal of sludge in a landfill without landfill gas capture;	Via checking the "Technical Specifications for Sludge Treatment of Municipal Wastewater Treatment Plant"/61/, CTI confirmed that if sludge from municipal wastewater treatment plants enter a domestic waste landfill, its sludge moisture content should be less than 60%. Therefore, the sludge needs to be dewatered before entering the landfill for landfill treatment. However, S7 does not reduce the moisture content of the sludge to below 60% before sending for landfill. This alternative is ruled out.

S8: Disposal of sludge in a landfill with landfill gas capture and flare;	Via checking the "Technical Specifications for Sludge Treatment of Municipal Wastewater Treatment Plant"/61/, CTI confirmed that if sludge from municipal wastewater treatment plants enter a domestic waste landfill, its sludge moisture content should be less than 60%. Therefore, the sludge needs to be dewatered before entering the landfill for landfill treatment. However, S8 does not reduce the moisture content of the sludge to below 60% before sending for landfill. This alternative is ruled out.
S9: Disposal of sludge in a landfill with landfill gas capture and utilization for energy generation;	Via checking the "Technical Specifications for Sludge Treatment of Municipal Wastewater Treatment Plant"/61/, CTI confirmed that if sludge from municipal wastewater treatment plants enter a domestic waste landfill, its sludge moisture content should be less than 60%. Therefore, the sludge needs to be dewatered before entering the landfill for landfill treatment. However, S9 does not reduce the moisture content of the sludge to below 60% before sending for landfill. This alternative is ruled out.
S10: Anaerobic digestion without methane recovery;	Via checking the public published article "Research and application status of residual sludge impurity separation equipment in sewage treatment plant"/62/, CTI confirmed that sludge from wastewater treatment plants has the characteristics of high sand content and low organic matter in China, in which the organic matter content of sludge is only 30%-60%, much lower than 60%-75% in foreign countries. Since the sludge often produces less gas in the process of anaerobic digestion, sludge treatment projects have less benefits and the gas production of many anaerobic digestion projects are not complied with the design value. In addition, the high sand content will also cause a certain degree of damage to the anaerobic digestion equipment. This alternative is ruled out.
S11: Anaerobic digestion with methane recovery and flaring;	Via checking the public published article "Research and application status of residual sludge impurity separation equipment in sewage treatment plant"/62/, CTI confirmed that sludge from wastewater treatment plants has the characteristics of high sand content and low organic matter in China, in which the organic matter content of sludge is only 30%-60%, much lower than 60%-75% in foreign countries. Since the sludge often produces less gas in the process of anaerobic digestion, sludge treatment projects have less benefits and the gas production of many anaerobic digestion projects are not complied with the design value. In addition, the high sand content will also cause a certain degree of damage to the anaerobic digestion equipment. This alternative is ruled out.
S12: Anaerobic digestion with methane recovery and utilization for energy generation.	Via checking the public published article "Research and application status of residual sludge impurity separation equipment in sewage treatment plant"/62/, CTI confirmed that sludge from wastewater treatment plants has the characteristics of high sand content and low organic matter in China, in which the

	organic matter content of sludge is only 30%-60%, much lower than 60%-75% in foreign countries. Since the sludge often produces less gas in the process of anaerobic digestion, sludge treatment projects have less benefits and the gas production of many anaerobic digestion projects are not complied with the design value. In addition, the high sand content will also cause a certain degree of damage to the anaerobic digestion equipment. This alternative is ruled out.
If the project activity includes electricity generation with biogas produced in a new anaerobic digester which treats the sludge from the aerobic wastewater treatment plant, plausible alternative scenarios for the generation of electricity have been determined and assessed as below,	
E1: Power generation using fossil fuels in a captive power plant;	By checking baseline survey report/13/, CTI confirmed that open anaerobic lagoon in the baseline scenario do not consume electricity. This alternative is ruled out.
E2: Electricity generation in the grid;	By checking baseline survey report/13/, CTI confirmed that open anaerobic lagoon in the baseline scenario do not consume electricity. This alternative is ruled out.
E3: Electricity generation using renewable sources of energy.	By checking baseline survey report/13/, CTI confirmed that open anaerobic lagoon in the baseline scenario do not consume electricity. This alternative is ruled out.
If the project activity includes heat generation with biogas produced in a new anaerobic digester which treats the sludge from the aerobic wastewater treatment plant, plausible alternative scenarios for the generation of heat have been determined and assessed as below,	
H1: Heat generation using fossil fuels in a captive cogeneration plant;	Via site inspection and checking FSR/5/, CTI confirmed that the project activity does not include heat generation with biogas produced in a new anaerobic digester which treats the sludge from the aerobic wastewater treatment plant. This alternative is ruled out.
H2: Heat generation using fossil fuels in a boiler;	Via site inspection and checking FSR/5/, CTI confirmed that the project activity does not include heat generation with biogas produced in a new anaerobic digester which treats the sludge from the aerobic wastewater treatment plant. This alternative is ruled out.
H3: Heat generation using renewable sources of energy.	Via site inspection and checking FSR/5/, CTI confirmed that the project activity does not include heat generation with biogas produced in a new anaerobic digester which treats the sludge from the aerobic wastewater treatment plant. This alternative is ruled out.

Hence, based on above assessment, CTI confirmed that the remaining realistic and credible alternative scenarios for the wastewater treatment processes are

Alternative 1: W2-S2, i.e. Aerobic wastewater treatment facilities (e.g. activated sludge or filter bed type treatment) with sludge being dried under controlled and aerobic conditions and its disposal in a landfill

with methane recovery or with use in soil application. This scenario is same to the project but is not a VCS project activity.

Alternative 2: W3-S2, i.e. Existing anaerobic open lagoons system without methane recovery and flaring with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery for each of the 16 open anaerobic lagoons used in the pre-project scenario, the residence time of the organic matter are all one year, and depth are all more than 5m respectively. This scenario continue adopts best available and commonly used low-cost solution for wastewater treatment.

CAR 09 and CAR 10 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.4.5 Additionality

By means of comparison of the Joint-PD-MR with "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 07.0)/43/, the validation team has assessed the additionality demonstration in accordance with applicable methodology and tool.

Step 1a of the tool were already done in section B.4 of this Joint-PD-MR for selection of alternative 1 and 2 as assessed in above section 3.3.4.

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

Step 1b: Consistency with mandatory applicable laws and regulations

Via searching the public website with laws and regulations in Guangdong Province and China by CTI, especially "Technical specifications for Anaerobic-Anoxic-Oxic activated sludge process"/63/ issued by Ministry of Ecology and Environment of the People's Republic of China, CTI confirmed that aerobic sewage treatment technology is a typical sewage treatment method at present, which conforms to Chinese laws and regulations and can effectively prevent and control sewage pollution. And via checking the "Guideline on Best Available Technologies of Pollution Prevention and Control for Township-villages"/64/ and "Guiding opinions on promoting rural domestic sewage treatment"/65/, CTI confirmed that the open anaerobic lagoon is a kind of wastewater treatment method recognized by the state in China, which need minimum financial cost and is compliance with laws and regulations and the state actively promotes low-cost, low energy consumption, easy maintenance and high-efficiency sewage treatment technologies, oxidation lagoons (including anaerobic lagoons) and other ecological treatment modes.

Besides, the overview of sludge treatment industry in China /66/ has been checked and CTI confirmed that the treatment of sludge is still mainly landfill.

As assessed above, CTI confirmed that the above options of Scenario W2-S2 and Scenario W3-S2 are considered to follow all mandatory applicable legal and regulatory requirements which are verified based in validation team's local expertise.

The outcome of Step 1b is same to Step 1a.

Step 2: Barrier analysis

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

Therefore, both alternatives come to Step 3.

Step 3: Investment analysis

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

As per paragraph 25 in section 4.4 of Tool 02 of Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)/43/. Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g. levelized cost of electricity production in \$/kWh or levelized cost of delivered heat in \$/GJ) most suitable for the project type and decision-making context. The unit cost of wastewater treatment (UCWT) has been used as the most meaningful indicator for the investment comparison analysis. The unit cost of service is calculated taking into consideration costs defined in the methodology: Land cost, Engineering, procurement and construction cost, operation and maintenance cost, administration cost, fuel cost, capital cost and interest, revenue from electricity and/or heat sales, all other costs of implementing the technology of each alternative option and all revenues generated by the implementation of the proposed technology except for carbon credits revenues which is confirmed in line with the tool.

Via checking the calculation formula and calculation process of the value of unit cost of wastewater treatment (UCWT) in the calculation sheet/3/, CTI confirmed that the formula and inputs values are correct and actual by checking the FSR which include the whole 16 wastewater plants into a project activity/5/ and Guideline on Project Construction and Investment for Rural Sewage Treatment/57/, thus CTI verified that the calculation results of the UCWT for scenario W2-S2 and scenario W3-S2 are correct.

Even if each plants have different service capacity, to achieve the Level A wastewater discharge standard, the unit cost of wastewater treatment is within a relatively fixed range for the same treatment technology which has been confirmed by checking the published report/76/.

By comparing with the results, CTI confirmed that the UCWT of the project activity(W2-S2) is more than that of the scenario W3-S2. In baseline and project scenario was 0.5 and 1.87 separately. UCWT in the project scenario is 3.74 time to the baseline scenario. Hence the anaerobic open lagoons system with sludge dried under controlled and aerobic conditions, with disposal in a landfill with methane recovery, i.e. W3-S2 is the financially most attractive scenario.

Furthermore, a sensitivity analysis has been provided in the JPM and the calculation sheet/3/. The analysis is assessed as follow,

The sensitivity analysis was demonstrated through two manners:

- a) Varying $\pm 10\%$ of three critical parameters (Construction Investment, Annual Operation Cost and Wastewater Treated). The selection is checked as in line with the requirements in Tool of Investment analysis (version 11.0)/52/ of "Only variables, including the Construction Investment, that constitute more than 20% of either total project costs or total project revenues

should be subjected to reasonable variation”, the Construction Investment and Wastewater Treated are checked as constitutes more than 20% of total project costs. The total Annual Operation Cost throughout the project lifetime is checked as accounts for more than 20% of the project cost.

Via checking the sensitivity analysis for these three critical parameters as provided in JPM and the calculation sheet/3/, CTI verified that the UCWT value of the project activity is still higher than the scenario W3-S2 by varying $\pm 10\%$ of three critical parameters.

- b) Threshold analysis by varying the above three parameters to make the UCWT value of the project activity is same to the scenario W3-S2. The threshold analysis of each parameter is assessed individually by the validation team as below,
 - i. If the Construction Investment decreases by 206%, the UCWT value of the project activity is same to the scenario W3-S2, however, via checking the price index of investment in fixed asset for China/67/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the Construction Investment reducing by 206% to make the project becomes economical attractive.
 - ii. If the Annual Operation Costs decrease by 114%, the UCWT value of the project activity is same to the scenario W3-S2, however, via checking the FSR/5/, CTI confirmed that Annual Operation Costs mainly consist of power cost, salary and welfare cost, water cost, sludge treatment cost, reagent fee, maintenance cost, management and other management cost. Via checking the average monthly wage level in Guangdong Province/67/, CTI confirmed that the average monthly wage keeps increasing in past years. Besides, via checking the indices of purchasing price of raw material, power and fuel/67/, CTI confirmed that the price index was rising in the past years. Therefore, it is not likely to implement the project activity with the Annual Operation Cost reducing by 114% to make the project becomes economical attractive.
 - iii. If the Wastewater Treated increases by 270%, the UCWT value of the project activity is same to the scenario W3-S2, however, via checking the FSR/5/ and wastewater service treatment agreement/15/, CTI confirmed that the amount of wastewater treated is fixed. A further 270% increase in the amount of wastewater to be treated is not possible. Hence it is not likely to increase amount of wastewater treated by 270% to make the project becomes economical attractive.

In conclusion, the investment analysis concludes that the UCWT value of the project activity will not be same or even lower than the scenario W3-S2 and the project activity is unlikely to be financially attractive. Threshold analysis is further proved this. The sensitivity analysis and threshold analysis was reproduced by the validation team and evaluated to be correct. Based above, it can confirm that the financial unattractiveness of the project is robust and thus the scenario W3-S2 is the most economically attractive option and plausible baseline scenario.

Hence the scenario W3-S2 is considered as baseline scenario which is “Existing anaerobic open lagoons system without methane recovery and flaring with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery”.

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

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

Step 4 Common practice analysis

The common practice analysis was checked strictly followed Methodological tool “Common practice” (Version 03.1)/46/.

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

The project made the 16 wastewater treatment plants as a consolidated project. Via checking the VCS standard 3.6.6, it requests that “The baseline determination and additionality demonstration for all project activity instances in a project shall be combined”. Furthermore, as per requirements of Step 1 of Tool 24 (Version 03.1), range as +/-50% of the total design capacity of the project should be calculated. Hence it is confirmed that the total capacity of the 16 plants have to be considered rather than the capacity of each individual plant. The project activity is to treat the wastewater and maximum design influent flow in total 16 plants of the project activity is 175,150 m³/d. So the range is the projects with capacity of wastewater treatment from 87,575 m³/d to 262,725 m³/d are considered as similar projects.

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

- a) *The projects are located in the applicable geographical area,*
- b) *The projects apply the same measure as the proposed project activity,*
- c) *The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity,*
- d) *The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g. clinker) as the proposed project plant,*
- e) *The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1,*
- f) *The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.*

Demonstration as follow,

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

geological conditions in Guangdong Province results in the different resource, thus region selected for common practice is Guangdong Province.

- b) Same measures is defined as: using aerobic biological treatment technology for wastewater treatment*
- c) Same energy source/fuel and feedstock: aerobic wastewater treatment process, sludge will be dried under controlled and aerobic conditions, with disposal in a landfill with methane recovery;*
- d) Treat wastewater and produced sludge will be dried under controlled and aerobic conditions, with disposal in a landfill with methane recovery,*
- e) Output range: treat wastewater from 87,575 m³/d to 262,725 m³/d*
- f) Commercial operation started before 03-September-2020.*

Thus, the wastewater treatment plants operated before 03-September-2020, "avoiding methane formation" with treatment of wastewater from 87,575 m³/d to 262,725 m³/d using aerobic biological treatment technology, the treated effluent meets the Level A standard of the "Emission Standard for Pollutants from Municipal Wastewater Treatment Plants (GB18918-2002)" and the level 1 standard of the Guangdong local standards "water pollutants emission limits (DB44/26-2001)" (40mg/L) and produced sludge will be dried under controlled and aerobic conditions, with disposal in a landfill with methane recovery in Guangdong Province are determined as similar projects.

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

The information source from Development and Reform Commission of Guangdong Province/68/, Department of Ecology and Environment of Guangdong Province/77/ and other public information from Guangdong Provincial Statistics Bureau website/69/ for the common practice analysis is available and checked by the audit team of CTI. The information used is evaluated to be credible.

CTI put the key words of the conditions based on above identified similar projects such as "wastewater treatment plants operated before 03-September-2020", "treatment of wastewater from 87,575 m³/d to 262,725 m³/d", "treated effluent meets the standard", "produced sludge will be dried under controlled and aerobic conditions" and searched the results. Via the source, CTI confirmed that there are no similar projects identified in Guangdong Province based on the above criteria.

Hence $N_{all}=0$.

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

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

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

For this project, $F=1-N_{diff}/N_{all}=1-1=0$ and $N_{all}-N_{diff}=0$.

It can be concluded that the project is not a common practice.

In conclusion, the project meets the criteria and tool “Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)”, thus deemed as additional.

CL 06, CAR 11 and CAR 12 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.4.6 Quantification of GHG Emission Reductions and Removals

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

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

Via verify the Joint-PD-MR/1/, it is confirmed the calculation of ERs is done as per the applied methodology (AM0080 ver. 08.0) with follow steps listed below.

Baseline emissions

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

$$BE_y = BE_{CH_4,ww,y} + BE_{CH_4,sl,y} + BE_{EL,y} + BE_{HG,y} + BE_{TR,sl,y} \quad (1)$$

Where:

BE_y	=	Baseline emissions in year y (tCO ₂ e/year)
$BE_{CH_4,ww,y}$	=	Methane emissions from anaerobic treatment of the wastewater in the baseline scenario in year y (tCO ₂ e/year)
$BE_{CH_4,sl,y}$	=	Methane emissions from treatment of sludge in the baseline scenario in year y (tCO ₂ e/year)
$BE_{EL,y}$	=	CO ₂ emissions associated with electricity generation that is displaced by the project activity and/or electricity consumption in the baseline scenario in year y (tCO ₂ /year)
$BE_{HG,y}$	=	CO ₂ emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year y (tCO ₂ /year)
$BE_{TR,sl,y}$	=	CO ₂ emissions associated with transportation of sludge in the baseline scenario in year y (tCO ₂ /year)

1. Calculation of baseline emissions from treatment of wastewater ($BE_{CH_4,ww,y}$)

$$BE_{CH_4,ww,y} = GWP_{CH_4} \times B_o \times COD_{BL,ww,y} \times MCF_{BL,ww,y} \quad (2)$$

Where:

$BE_{CH_4,ww,y}$	=	Methane emissions from anaerobic treatment of the wastewater in the baseline scenario in year y (tCO ₂ e/year)
GWP_{CH_4}	=	Global Warming Potential of methane valid for the commitment period (tCO ₂ e/tCH ₄)
B_o	=	Quantity of chemical oxygen demand that would have been treated in the baseline scenario in year y (tCOD/year)
$COD_{BL,ww,y}$	=	Quantity of chemical oxygen demand that would have been treated in the baseline scenario in year y (tCOD/year)
$MCF_{BL,ww,y}$	=	Average baseline methane conversion factor in year y, representing the fraction of organic load that would be degraded to CH ₄ in the baseline scenario (fraction)

Determination of $COD_{BL,ww,y}$

Via checking the baseline survey report/13/, CTI confirmed that baseline scenario is that wastewater continues to be treated by existing anaerobic lagoons, hence, $COD_{BL,ww,y}$ should be adjusted by an effluent adjustment factor which relates the COD supplied to the lagoon with the COD in the effluent, as follows:

$$COD_{BL,ww,y} = AD_{BL} \times COD_{PJ,ww,y} \quad (3)$$

Where:

$COD_{BL,ww,y}$	=	Quantity of chemical oxygen demand that would have been treated in the baseline scenario in year y (tCOD/year)
AD_{BL}	=	Effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons in the baseline scenario (fraction)
$COD_{PJ,ww,y}$	=	Quantity of chemical oxygen demand that is treated in the aerobic wastewater treatment plant in the project activity in year y (tCOD/year)

Determination of $COD_{PJ,ww,y}$

$$COD_{PJ,ww,y} = \sum Q_{PJ,ww,y} \times W_{PJ,COD,ww,m} \quad (4)$$

Where,

$Q_{PJ,ww,y}$	=	Quantity of wastewater that is treated in the aerobic wastewater plant in the project activity in month m
$W_{PJ,COD,ww}$	=	Average Chemical Oxygen Demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m
m	=	Months of year y of the crediting period

Determination of AD_{BL}

W3 that existing anaerobic open lagoons system is identified as the baseline scenario, as per the methodology, if the baseline scenario is identified as being existing open lagoons (W3), use either Option (A) or Option (B) to determine AD_{BL} , PP has chosen the Option (A) due to at least one year historical data of the COD inflow and COD effluent are available, via checking the FSR/5/, CTI confirmed that one year historical data from 01-January-2018 to 31-December-2018 of the COD inflow and COD effluent from the

existing anaerobic open lagoons have been available. Hence AD_{BL} should be calculated according to the Option A of page 9 in the methodology.

Hence, as per the methodology, below formula has been used,

$$AD_{BL} = (1 - (COD_{BL,out,x} / COD_{BL,in,x})) \quad (5)$$

Where,

AD_{BL}	=	Effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons in the baseline scenario (fraction)
$COD_{BL,out,x}$	=	COD of the effluent of open lagoons in the baseline scenario in the period x (tCOD)
$COD_{BL,in,x}$	=	COD directed to the open lagoons in the baseline scenario in the period x (tCOD)
x	=	Representative historical reference period (at least one year)

Determination of $MCF_{BL,ww,y}$

The quantity of methane generated from COD disposed to the open lagoon depends mainly on the temperature and the depth of the lagoon. Accordingly, the methane conversion factor is calculated based on a factor f_d , expressing the influence of the depth of the lagoon on methane generation, and a factor $f_{BL,T,y}$ expressing the influence of the temperature on the methane generation. In addition, a conservativeness factor of 0.89 is applied to account for the considerable uncertainty associated with this approach.

Hence, as per the methodology, below formula has been used,

$$MCF_{BL,ww,y} = f_{BL,d} \times f_{BL,T,y} \times 0.89 \quad (6)$$

Where,

$MCF_{BL,ww,y}$	=	Average baseline methane conversion factor in year y, representing the fraction of organic load that would be degraded to CH_4 in the baseline scenario (fraction)
$f_{BL,d}$	=	Factor expressing the influence of the depth of the lagoon on methane generation (fraction)
$f_{BL,T,y}$	=	Factor expressing the influence of the temperature on the methane generation in year y (fraction)
0.89	=	Conservativeness factor

As per the methodology, for the purpose of ex ante estimations, 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories default values of methane conversion factors (MCF) for different treatment types and conditions have been used as per IPCC Guidelines/40/.

Determination of $f_{BL,T,y}$

Based on checking the public information of the temperature, CTI confirmed that local historical temperature data in Guangdong Province will be used. Therefore, the factor $f_{BL,T,y}$ is calculated with the help of a monthly stock change model which aims at assessing how much COD degrades in each month. Based on monthly values of $f_{T,m}$ the annual value $f_{BL,T,y}$ is calculated as follows:

$$f_{BL,T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{BL,available,m}}{\sum_{m=1}^{12} AD_{BL} \times Q_{PJ,ww,m} \times WP_{PJ,ww,COD,m}} \quad (7)$$

Where,

$f_{BL,T,y}$	=	Factor expressing the influence of the temperature on the methane generation in year y(fraction)
$f_{T,m}$	=	Factor expressing the influence of the temperature on the methane generation in month m(fraction)
$COD_{BL,availab}$	=	Quantity of chemical oxygen demand available for degradation in month m (tCOD)
AD_{BL}	=	Effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons in the baseline scenario (fraction)
$Q_{PJ,ww,m}$	=	Quantity of wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m (m^3)
$W_{PJ,ww,COD,m}$	=	Average chemical oxygen demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m (tCOD/ m^3)
m	=	Months of year y of the crediting period

Determination of $f_{T,m}$

The monthly factor to account for the influence of the temperature on methane generation is calculated based on the van't Hoff-Arrhenius approach:

$$f_{T,m} = \begin{cases} 0 & \text{if } T_{2,m} < 283K \\ \exp\left(\frac{E \times (T_{2,m} - T_1)}{R \times T_1 \times T_{2,m}}\right) & \text{if } 283K < T_{2,m} < 303K \\ 1 & \text{if } T_{2,m} > 303K \end{cases} \quad (8)$$

Where,

$f_{T,m}$	=	Factor expressing the influence of the temperature on the methane generation in month m(fraction)
E	=	Activation energy constant (15,175 cal/mol)
T1	=	303.16 K (273.16 K + 30 K)
R	=	Ideal gas constant (1.987 cal/K.mol)
$T_{2,m}$	=	Average temperature at the project site in month m (K)
m	=	Months of year y of the crediting period

As indicated in the equation above, the value of $f_{T,m}$ cannot exceed 1 and should be assumed to be zero if the ambient temperature is below 10 °C.

Determination of $COD_{BL,available,m}$

The quantity of chemical oxygen demand available for degradation in the open lagoon for each month m, is given by the balance of the quantities of wastewater directed to the lagoon, the quantity of organic compounds that decay in the lagoons, and the quantity of any effluent water from the lagoon. Therefore, $COD_{BL,available,m}$ is assumed to be equal to the amount of organic matter directed to the open lagoon, less any effluent, plus the COD that may have remained in the lagoon from previous months, as follows:

$$COD_{BL,available,m} = AD_{BL} \times Q_{PJ,ww,m} \times w_{PJ,ww,m} \times (1 - f_{T,m}) \times COD_{BL,available,m-1} \quad (9)$$

Where,

$COD_{BL,available,m}$	=	Quantity of chemical oxygen demand available for degradation in month m (tCOD)
AD_{BL}	=	Effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons in the baseline scenario (fraction)
$Q_{PJ,ww,m}$	=	Quantity of wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m (m ³)
$w_{PJ,ww,m}$	=	Average chemical oxygen demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m (tCOD/m ³)
$f_{T,m}$	=	Factor expressing the influence of the temperature on the methane generation in month m (fraction)
m	=	Months of year y of the crediting period

The baseline scenario of the project is that the wastewater continues to be treated by the open anaerobic lagoons. Via checking the Baseline Survey Report/13/, CTI confirmed that the retention time of organic matter in the local anaerobic lagoons of the project is 1 year.

2. Calculation of baseline emissions from treatment of sludge ($BE_{CH4,sl,y}$)

Via checking the baseline survey report/13/, CTI confirmed that the sludge produced in the baseline scenario from the treatment of wastewater in the open lagoons system have been treated by means of controlled drying under aerobic conditions and then disposed to a landfill with methane recovery (S2), hence based on the applied methodology, the corresponding methane emissions ($BE_{CH4,sl,y}$) are considered to be negligible and are not accounted for.

Hence, $BE_{CH4,sl,y} = 0$

3. Calculation of baseline emissions from consumption of electricity ($BE_{EL,y}$)

Via checking the baseline survey report/13/, CTI confirmed that the baseline scenario is open anaerobic lagoons system, and no electricity was used.

Hence, $BE_{EL,y} = 0$

4. Baseline emissions from the generation of heat ($BE_{HG,y}$)

Via checking the baseline survey report/13/, CTI confirmed that the baseline scenario is open anaerobic lagoons system, and no generation of heat involved.

Hence, $BE_{HG,y} = 0$

5. Baseline emissions from transportation of sludge ($BE_{TR,sl,y}$)

As per the methodology, the baseline emissions resulting from transportation of sludge that have been produced in the baseline scenario should be calculated as:

$$BE_{TR,sl,y} = \sum_i N_{BL,i,y} \times D_{BL,i} \times F_{BL,i} \times NCV_{BL,j} \times EF_{BL,j} \quad (10)$$

Where,

$BE_{TR,sl,y}$	=	CO ₂ emissions associated with transportation of sludge in the baseline scenario in year y (tCO ₂ /year)
$N_{BL,i,y}$	=	Number of trips (vehicle of type i with similar loading capacity) for transportation of the sludge that would have been produced in the baseline scenario in year y (trips)
$D_{BL,i}$	=	Average distance per trip, that would have been travelled by the transportation vehicle of type i, for transportation of sludge in the baseline scenario (km)
$F_{BL,i}$	=	Specific fuel consumption of the transportation vehicle of type i (mass or volume units of fuel/km)
$NCV_{BL,j}$	=	Net calorific value of the transportation fuel j (TJ/mass or volume units)
$EF_{BL,j}$	=	CO ₂ emission factor of the transportation fuel j (tCO ₂ /TJ)
i	=	Vehicle type
j	=	Fuel type used in vehicles
y	=	Year of the crediting period

If the emissions associated with transportation of sludge in the baseline scenario and in the project scenario are found to be comparable (i.e. within +1% range) or emissions in the project scenario are lower, then both can be excluded in the calculation of baseline emissions and project emissions as a simplification.

Determination of $N_{BL,i,y}$

The number of trips of the transportation vehicle of type i is calculated as:

$$N_{BL,i,y} = \frac{Q_{BL,sl,y}}{q_{BL,i}} \quad (11)$$

Where,

$N_{BL,i,y}$	=	Number of trips (vehicle of type i with similar loading capacity) for transportation of final sludge generated by the waste water treatment system in the baseline scenario in the year y (trips)
$Q_{BL,sl,y}$	=	Quantity of sludge that would have been produced and treated in the baseline scenario in the year y (tonnes)
$q_{BL,i}$	=	Average vehicular capacity of the transportation vehicle of type i (tonnes/trip)
y	=	Year of the crediting period

Project Emissions

Based on the applied methodology, the Project emissions are estimated as follows:

$$PE_y = PE_{CH_4,ww,y} + PE_{CH_4,sl,y} + PE_{N_2O,sl,y} + PE_{EC,y} + PE_{FC,y} + PE_{TR,sl,y} \quad (12)$$

Where:

- PE_y = Project emissions in the year y (tCO₂e/year)
- $PE_{CH_4,ww,y}$ = Project emissions from inefficiency of the wastewater treatment system and presence of degradable organic carbon in the treated wastewater.
- $PE_{CH_4,sl,y}$ = Methane emissions from treatment of sludge in the project activity in year y (tCO₂/year).
- $PE_{N_2O,sl,y}$ = Project N₂O emissions on account of energy final sludge land application.
- $PE_{EC,y}$ = Project emissions associated with electricity consumption in the project activity.
- $PE_{FC,y}$ = Project emissions associated with fossil fuel consumption in the project activity.
- $PE_{TR,sl,y}$ = Project emissions on account of transportation of final sludge produced in the year y (tCO₂/annum).

i) Methane emissions from treatment of wastewater ($PE_{CH_4,ww,y}$)

Project emissions due to wastewater treatment comprise two components, emissions from the aerobic wastewater treatment plant due to inadequate operation and/or overloading, and emissions due to the presence of degradable organic carbon in the treated wastewater after leaving the aerobic wastewater treatment plant:

$$PE_{CH_4,ww,y} = PE_{CH_4,wwtp,y} + PE_{CH_4,effl,y} \quad (13)$$

Where:

- $PE_{CH_4,ww,y}$ = Project emissions from inefficiency of the wastewater treatment system and presence of degradable organic carbon in the treated wastewater.
- $PE_{CH_4,wwtp,y}$ = Methane emissions from the aerobic wastewater treatment plant in year y due to inadequate operation and/or overloading (tCO₂e/year);
- $PE_{CH_4,effl,y}$ = Methane emissions due to the presence of degradable organic carbon in the effluent from the aerobic wastewater treatment plant in year y (tCO₂e/year);

Due to the highly site specific nature of the factors leading to the development of anaerobic conditions in aerobic wastewater treatment plants, it is difficult to provide a clear-cut procedure and monitoring parameters to determine CH₄ emissions for plants under inadequate operational conditions. This methodology applies a proxy parameter, the oxidisation ratio (OR) described further below. In order to conservatively account for emissions, the higher value (MCF=0.4) of the IPCC MCF range for aerobic treatment plant should be used if the oxidisation ratio (OR) is out of an acceptable range. If the oxidization ratio is within the acceptable range, emissions should be considered zero.

Therefore, methane emissions from the aerobic wastewater treatment plant in year y due to inadequate operation and/or overloading should be calculated as follows:

$$\text{If } OR_i \geq 0.8, PE_{CH_4,wwp,y} = 0 \quad (14)$$

$$\text{If } OR_i < 0.8, PE_{CH_4,wwp,y} = \sum_{i=1}^{365} GWP_{CH_4} \times B_{0,ww} \times 0.4 \times (COD_{PJ,ww,i} - COD_{PJ,effl,i}) \quad (15)$$

Where:

- OR_i = Oxidisation ratio, representing the ratio between organic matter in the output and organic matter in the input of the aerobic wastewater treatment plant in day i of year y (fraction);
- GWP_{CH_4} = Global Warming Potential of CH₄. (tCO₂/tCH₄);
- $B_{0,ww}$ = Maximum methane producing capacity of the wastewater treated in the year y.(Faction)
- 0.4 = Default methane conversion factor (MCF) for not well managed plants (fraction);
- $COD_{PJ,ww,i}$ = Quantity of chemical oxygen demand that enters the aerobic wastewater treatment plant in the project activity in the day i of year y (tCOD);
- $COD_{PJ,effl,i}$ = Quantity of chemical oxygen demand in the effluent of the wastewater treatment plant in the project activity in the day i of year y (tCOD).

Determination of the quantities of chemical oxygen demands ($COD_{PJ,ww,i}$ and $COD_{PJ,effl,i}$)

The quantities of chemical oxygen demands in the wastewater and effluent are calculated as follows:

$$COD_{PJ,ww,i} = Q_{PJ,ww,i} \times w_{PJ,COD,ww,i} \quad (16)$$

$$COD_{PJ,effl,i} = Q_{PJ,effl,i} \times w_{PJ,COD,effl,i} \quad (17)$$

Where:

- $COD_{PJ,ww,i}$ = Quantity of chemical oxygen demand that enters the aerobic wastewater treatment plant in the project activity in the day i of year y (tCOD)
- $Q_{PJ,ww,i}$ = Quantity of wastewater that is treated in the aerobic wastewater treatment plant in the project activity in day i of year y (m³)
- $w_{PJ,COD,ww,i}$ = Average chemical oxygen demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in day i of year y (tCOD/m³)
- $COD_{PJ,effl,i}$ = Quantity of chemical oxygen demand in the effluent of the wastewater treatment plant in the project activity in the day i of year y (tCOD)
- $Q_{PJ,effl,i}$ = Quantity of effluent that leaves the aerobic wastewater treatment plant in the project activity in day i of year y (m³)
- $w_{PJ,COD,effl,i}$ = Average chemical oxygen demand in the effluent that leaves the aerobic wastewater treatment plant in the project activity in day i of year y (tCOD/m³)

Determination of the oxidisation ratio (OR_i)

As per the methodology, the determination of whether the aerobic wastewater treatment system is well operated (managed) or not is made by monitoring the quality of the wastewater at the outlet of the

treatment plant to make sure it meets the target specified in the proposed design of the proposed CDM project activity. If it does meet this requirement it can be trusted to be a well managed facility with little to no CH₄ emissions during the project implementation. This approach is considered as appropriate, but the following two problems are often encountered:

- In many developing countries the urban areas either do not have separate storm water drain systems or the storm water drain systems do not work properly. Due to this reason, during rainy seasons, the wastewater gets diluted from the ingress of rainwater before reaching the treatment plant. Because of the dilution effect, the COD in the wastewater decreases and can appear within the acceptable range even if the treatment plant is not in operation;
- The legislation in many of the developing countries specifies the maximum limit for wastewater COD, but the legislation generally does not specify the particular wastewater treatment technology which should be used to achieve the objective. It is possible to achieve an acceptable level of COD in the final effluent by diluting it (directly mixing water to it) just before it is discharged into the final receiving body (mostly fresh water streams).

To address these two issues, the following approach is suggested:

$$OR_i = \frac{COD_{PJ,ww,i} - COD_{PJ,effl,i}}{COD_{PJ,ww,i}} \quad (18)$$

Where:

OR_i	=	Oxidisation ratio, representing the ratio between organic matter in the output and organic matter in the input of the aerobic wastewater treatment plant in day i of year y (fraction)
$COD_{PJ,ww,i}$	=	Quantity of chemical oxygen demand that enters the aerobic wastewater treatment plant in the project activity in the day i of year y (tCOD)
$COD_{PJ,effl,i}$	=	Quantity of chemical oxygen demand in the effluent of the wastewater treatment plant in the project activity in the day i of year y (tCOD)

ii) Methane emissions due to the presence of degradable organic carbon in the effluent ($PE_{CH_4,effl,y}$)

The methane emissions due to the presence of degradable organic carbon in the effluent from the aerobic wastewater treatment plant are calculated as:

$$PE_{CH_4,effl,y} = GWP_{CH_4} \times MCF_{PJ,effl,y} \times \sum_{i=1}^{365} COD_{PJ,effl,i} \times B_0 \quad (19)$$

Where:

$PE_{CH_4,effl,y}$	=	Methane emissions due to the presence of degradable organic carbon in the effluent from the aerobic wastewater treatment plant in year y (tCO _{2e} /year)
GWP_{CH_4}	=	Global Warming Potential of methane valid for the commitment period (tCO _{2e} /tCH ₄)
$MCF_{PJ,effl,y}$	=	Average methane conversion factor in year y, representing the fraction of organic load in the effluent that is degraded to CH ₄ in year y. The factor is based on the type of

	treatment and discharge pathway of the effluent of the aerobic wastewater treatment plant (fraction)
B_0	= Maximum methane producing capacity of wastewater treated in the year y, expressing the maximum amount of CH ₄ that can be produced from a given quantity of chemical oxygen demand (tCH ₄ /tCOD)
$COD_{PJ,effl,i}$	= Quantity of chemical oxygen demand in the effluent of the wastewater treatment plant in the project activity in the day i of year y (tCOD)
y	= Year of the crediting period

Determination of $MCF_{PJ,effl,y}$

$$MCF_{PJ,effl,y} = f_{PJ,d,y} \times f_{PJ,T,y} \times 0.89 \quad (20)$$

Where:

$MCF_{PJ,effl,y}$	= Average baseline methane conversion factor in year y, representing the fraction of organic load in the effluent that is degraded to CH ₄ in year y. The factor is based on the type of treatment and discharge pathway of the effluent of the aerobic wastewater treatment plant (fraction)
$f_{PJ,d,y}$	= Factor expressing the influence of the depth on methane generation in year y
$f_{PJ,T,y}$	= Factor expressing the influence of the temperature on the methane generation in year y
0.89	= Conservativeness factor

For the purpose of ex ante estimations, IPCC default values of methane conversion factors (MCF) for different treatment types and conditions should be used as per IPCC Guidelines.

Determination of $f_{PJ,T,y}$

$$f_{PJ,T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{PJ,available,m}}{\sum_{m=1}^{12} Q_{PJ,effl,m} \times W_{PJ,COD,effl,m}} \quad (21)$$

Where:

$f_{PJ,T,y}$	= Factor expressing the influence of the temperature on the methane generation in year y
$f_{T,m}$	= Factor expressing the influence of the temperature on the methane generation in month m
$COD_{PJ,available}$	= Quantity of chemical oxygen demand in the effluent from the aerobic wastewater treatment plant available for degradation in month m (tCOD)
$Q_{PJ,effl,m}$	= Quantity of effluent that leaves the aerobic wastewater treatment plant in the project activity in month m of year y (m ³)

$w_{PJ,COD,effl,m}$ = Average chemical oxygen demand in the effluent that leaves the aerobic wastewater treatment plant in the project activity in month m of year y (tCOD/m³)

m = Months of year y of the crediting period

$f_{T,m}$ is determined as per the above equation (8).

Determination of $COD_{PJ,available,m}$

The quantity of chemical oxygen demand available in the effluent for each month m, is given by the balance of the quantities of COD in the effluent, the quantity of organic compounds that decay, and the quantity of final effluent. Therefore, $COD_{PJ,available,m}$ is assumed to be equal to the amount of organic matter directed to the discharge pathway, less final effluent, plus the COD that may have remained in the discharge pathway from previous months, as follows:

$$COD_{PJ,available,m} = Q_{PJ,effl,m} \times w_{PJ,COD,effl,m} + (1 - f_{T,m}) \times COD_{PJ,available,m-1} \quad (22)$$

Where:

$COD_{PJ,available,m}$ = Quantity of chemical oxygen demand available for degradation in the effluent from the aerobic wastewater treatment plant in month m (tCOD)

$Q_{PJ,effl,m}$ = Quantity of effluent that leaves the aerobic wastewater treatment plant in the project activity in month m of year y (m³)

$w_{PJ,COD,effl,m}$ = Average chemical oxygen demand in the effluent that leaves the aerobic wastewater treatment plant in the project activity in month m of year y (tCOD/m³)

$f_{T,m}$ = Factor expressing the influence of the temperature on the methane generation in month m

m = Months of year y of the crediting period

The carry-over calculations are limited to a maximum of one year.

iii) Methane emissions from treatment of sludge in the project activity in year y ($PE_{CH4,sl,y}$)

Via site inspection and checking the FSR/5/ and the Sludge Disposal Letter/14/, CTI confirmed that sludge in this project activity is dried under controlled and aerobic conditions, and then disposed to landfills with methane recovery or used in soil application, corresponding project emissions are considered to be negligible and should not be accounted for.

Hence, $PE_{CH4,sl,y} = 0$

iv) N₂O emissions from treatment of sludge in the project activity in year y ($PE_{N2O,sl,y}$)

As per the methodology, Nitrous oxide emissions are assumed to be negligible and need not be accounted for if the sludge is:

- Dried under controlled and aerobic conditions, and then disposed to a landfill; or,

- Treated in a new anaerobic digester and the residues from the anaerobic digester are dehydrated, limed and stored before final disposal in a controlled landfill.

Via site inspection and checking the FSR/5/ and the Sludge Disposal Letter/14/, CTI confirmed that sludge in this project activity is dried under controlled and aerobic conditions, and then disposed to landfills with methane recovery or used in soil application.

Hence, $PE_{N2O,sl,y} = 0$

v) Project emissions associated with electricity consumption in the project activity ($PE_{EC,y}$)

The project emissions from electricity consumption which used to run the entire aerobic wastewater treatment plant is calculated according to the Tool 05 “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” (version 03.0).

$$PE_{EC,y} = \sum_j EC_{PJ,j,y} \times EF_{EL,j,y} \times (1 + TDL_{j,y}) \quad (23)$$

Where:

$PE_{EC,y}$	=	Project emissions from electricity consumption in year y (t CO _{2e})
$EC_{PJ,j,y}$	=	Quantity of electricity consumed by the project electricity consumption source <i>j</i> in year y (MWh/yr)
$EF_{EF,j,y}$	=	Emission factor for electricity generation for source <i>j</i> in year y (t CO ₂ /MWh)
$TDL_{j,y}$	=	Average technical transmission and distribution losses for providing electricity to source <i>j</i> in year y

Determination of $EC_{PJ,j,y}$

The electricity consumed by the project $EC_{PJ,j,y}$ will be provided from the regional power grid SCPG. So for ex ante determination, it is assumed that the electricity consumed of the project activities comes from the SCPG is derived from FSR/5/.

Determination of $EF_{EF,j,y}$

As above, electricity consumption is from the grid, then $EF_{EF,j,y}$ is equal to $EF_{grid,CM,y}$ which is determined by “Tool to calculate the emission factor for an electricity system” (version 07.0), the stepwise of calculation of $EF_{EF,j,y}$ has been provided in the JPM which is verified in line with the “Tool to calculate the emission factor for an electricity system” (version 07.0). And the data source of the emission factor is derived from 2019 China regional power grid carbon dioxide baseline emission factor OM calculation instructions/60/ which is verified as the latest issued value by China DNA.

Determination of $TDL_{j,y}$

A default value of 20% is used as per the “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/47/.

vi) Project emissions from transportation of sludge ($PE_{TR,sl,y}$)

The project emissions resulting from transportation of final sludge produced in the project activity should be calculated as:

$$PE_{TR,sl,y} = \sum_i N_{PJ,i,y} \times D_{PJ,i,y} \times F_{PJ,i,y} \times NCV_{PJ,j,y} \times EF_{PJ,j,y} \quad (24)$$

Where:

$PE_{TR,sl,y}$	=	CO ₂ emissions associated with transportation of sludge in the project activity in year y (tCO ₂ /year)
$N_{PJ,i,y}$	=	Number of trips (vehicle of type i with similar loading capacity) for transportation of the sludge produced in the project activity in the year y (trips)
$D_{PJ,i,y}$	=	Average distance per trip travelled by the transportation vehicle of type i for transportation of sludge generated by the wastewater treatment system in the project activity in the year y (km)
$F_{PJ,i,y}$	=	Specific fuel consumption of the transportation vehicle of type i in the year y (mass or volume units of fuel/km)
$NCV_{PJ,j,y}$	=	Net calorific value of the transportation fuel j in the year y (TJ/mass or volume units)
$EF_{PJ,j,y}$	=	CO ₂ emission factor of the transportation fuel j in the year y (tCO ₂ /TJ)
i	=	Type of vehicle
j	=	Year of the crediting period
y	=	Year of the crediting period

If the emissions associated with transportation of sludge in the baseline scenario and in the project scenario are found to be comparable (i.e., within +1% range) or emissions in the project scenario are lower, then both can be excluded in the calculation of baseline emissions and project emissions as a simplification.

Determination of $N_{PJ,i,y}$

The number of trips of the transportation vehicle of type i is calculated as:

$$N_{PJ,i,y} = \frac{Q_{PJ,sl,y}}{q_{PJ,i}} \quad (25)$$

Where:

$Q_{PJ,sl,y}$	=	Quantity of sludge produced in the project activity in the year y (tonnes)
$q_{PJ,i}$	=	Average vehicular capacity of the transportation vehicle of type i (tonnes/trip)

Leakage

No leakage is considered in this methodology. Hence, $LE_y = 0$

Emission reductions:

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

Where:

ER_y Emission reductions of the project activity in year y (t CO₂e/yr).

BE_y Baseline emissions in year y (t CO₂e/yr).

PE_y Project emissions in year y (t CO₂/yr).

LE_y Leakage emissions in year y (t CO₂/yr)

Ex ante calculation of emission reductions

For Baseline Emission calculation, as per the equation as below

$$\begin{aligned} BE_y &= BE_{CH_4,ww,y} + BE_{CH_4,sl,y} + BE_{EL,y} + BE_{HG,y} + BE_{TR,sl,y} \\ &= BE_{CH_4,ww,y} + BE_{TR,sl,y} \end{aligned}$$

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

Baseline Emissions: $BE_y = 95,176$ tCO₂e

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

Project Emissions

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

$$\begin{aligned} PE_y &= PE_{CH_4,ww,y} + PE_{CH_4,sl,y} + PE_{N_2O,sl,y} + PE_{EC,y} + PE_{FC,y} + PE_{TR,sl,y} \\ &= PE_{EC,y} + PE_{TR,sl,y} \end{aligned}$$

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

Project emission $PE_y = 11,880$ tCO₂e

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

Leakage

Based on above assessment, $LE_y = 0$

Emission reductions

$$ER_y = BE_y - PE_y - LE_y$$

Based on the above assessment of the ex ante determined values, it is verified that the annual ex ante determined ERs calculated result is 83,042 tCO₂/yr.

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

In conclusion, based on above values for each parameter for determine the ex-ante of emission reduction calculation, the CTI verified that results in Joint-PD-MR are correct for the ex-ante ER values during the fixed 10 years crediting period.

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

CL 07, CL 08, CL 09, CAR 13, CAR 14, CAR 15, CAR 16, CAR 17, CAR 18, CAR 19 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.4.7 Methodology Deviations

There are no any methodology deviations applied to the project.

3.4.8 Monitoring Plan

1. Data and parameters available at validation

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

GWP_{CH4}	Global Warming Potential of CH₄
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	IPCC Fifth Assessment Report (AR5)
Correct value provided?	Yes – 28 tCO ₂ e/tCH ₄ Derived from IPCC Fifth Assessment Report (AR5)/41/
Has this value been verified?	Confirmed as correct for ex ante determination. Via checking the 100-year values are adopted from Box 3.2, table 1, IPCC Fifth Assessment Report (AR5)/41/ and VCS Standard Version 4.3/51/, it is verified that the value is correct.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

EF_{EL,j,y} (EF_{grid,CM,y})	Combined margin emission factor for the grid in year y
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Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	The value is derived from 2019 China regional power grid carbon dioxide baseline emission factor OM calculation instructions/60/ which is verified as the latest issued value by China DNA.
Correct value provided?	Yes – 0.5089 tCO ₂ /MWh (0.8042 tCO ₂ /MWh*0.5+0.2135 tCO ₂ /MWh *0.5)
Has this value been verified?	Yes. Confirmed as calculated correctly for ex ante determination as per the applied Tool to calculate the emission factor for an electricity system (Version 07.0)/45/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

B₀	<i>Maximum methane producing capacity of wastewater, expressing the maximum amount of CH₄ that can be produced from a given quantity of chemical oxygen demand</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Table 6.2 in Ch6 of Vol5 in 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories /40/ and applied methodology AM0080 version 01/42/
Correct value provided?	Yes – 0.21 tCH ₄ /tCOD
Has this value been verified?	Yes. As per the applied methodology, the default IPCC value for B ₀ is 0.25 kg CH ₄ /kg COD. However, taking into account the uncertainty of this estimate, project participants should use a value of 0.21 kg CH ₄ /kg COD as a conservative assumption for B ₀ .
Choice of data correctly justified?	Yes.
Measurement method correctly described?	N/A

COD_{BL,in,x} and COD_{BL,out,x}	Respectively, COD directed to the open lagoons in the baseline scenario in the period x, and COD of the effluent of open lagoons in the baseline scenario in the period x.
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	FSR/5/ with one year historical data from 01-January-2018 to 31-December-2018 of the COD inflow and COD effluent, quantity of sludge transportation of the anaerobic lagoons in 2018 conducted by local government.
Correct value provided?	Yes – Refer to JPM for details of the both values of each plant
Has this value been verified?	Yes. Via checking the FSR/5/, CTI confirmed that the one year historical data of the COD inflow and COD effluent are and hence in line with the option A/B of the applied methodology for determination of COD _{BL,in,x} and COD _{BL,out,x} .
Choice of data correctly justified?	Yes.

Measurement method correctly described?	N/A
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$f_{BL,d}$	<i>Factor expressing the influence of the depth of the lagoon on methane generation</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Applied methodology AM0080 version 01/42/
Correct value provided?	Yes – Apply the following values for the corresponding average depth of the open lagoon: Depth > 5 m: 70% Depth 1 – 5 m: 50% Depth < 1 m: 0% Value is determined as 70% used for this project
Has this value been verified?	Yes. Via site inspection and checking the FSR/5/ and baseline survey report/13/, CTI verified that existing anaerobic open lagoons systems in the baseline scenario are total 16 open stabilization lagoons with depth all greater than 5 m.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$Q_{BL,sl,y}$	<i>Quantity of sludge that would have been produced and treated in the baseline scenario in the year y</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	FSR/5/ with one year historical data from 01-January-2018 to 31-December-2018 of the COD inflow and COD effluent, quantity of sludge transportation of the anaerobic lagoons in 2018 conducted by local government.
Correct value provided?	Yes – Refer to JPM for details of the both values of each plant
Has this value been verified?	Yes. As per the previous assessment, the baseline scenario is defined as an existing open lagoon (W3), historical records of monthly quantity of sludge generated per unit volume of wastewater being treated in the open lagoon have been collected for one year before the implementation of the project activity which has been confirmed by checking the FSR/5/. In order to ensure a conservative computation of baseline emissions, the lowest amongst the monthly values have been considered and multiplied by the quantity of wastewater treated in year y to estimate the sludge that would have been produced which is verified in line with the applied methodology.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

DBL,i	<i>Average distance per trip, that would have been travelled by the transportation vehicle of type i, for transportation of sludge in the baseline scenario</i>
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Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Baseline Survey Report/13/ with historical data available on-site with the distances of sludge transportation between the open lagoons and landfills in the baseline scenario
Correct value provided?	Yes – Refer to JPM for details of the both values of each plant
Has this value been verified?	Yes. The values are confirmed in line with the historical data available on-site with the distances of sludge transportation between the open lagoons and landfills/13/, and has been verified by checking the Google satellite map
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$F_{BL,i}$	<i>Specific fuel consumption of the transportation vehicle of type i</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Baseline Survey Report/13/ with historical data available on-site shows that the fuel used by the local sludge transport vehicle is diesel. And the fuel consumption per kilometer is confirmed from the Table 1 in Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises/39/ (Diesel, > 4 tonne < 8 tonne) which is verified as correct.
Correct value provided?	Yes – 0.209 Liter/km
Has this value been verified?	Yes. The fuel type is confirmed in line with the historical data available/5/, and the value of fuel consumption per kilometer is verified as correct by checking the Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises/39/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

$NCV_{BL,j}$ and $EF_{BL,j}$	<i>Respectively: net calorific value of the transportation fuel j, and CO₂ emission factor of the transportation fuel j</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Baseline Survey Report/13/ with historical data available on-site shows that the fuel used by the local sludge transport vehicle is diesel. And the net calorific value of the diesel, and CO ₂ emission factor of the diesel have been taken from Table 2 in Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel)
Correct value provided?	Yes – $NCV_{BL,j,y} = 0.04333$ TJ/tonne; $EF_{BL,j,y} = 74.1$ tCO ₂ /TJ
Has this value been verified?	Yes. The fuel type is confirmed in line with the historical data available in Baseline Survey Report/13/, and the value of net

	calorific value of the diesel, and CO ₂ emission factor of the diesel is verified as correct by checking the IPCC/40/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

<i>q_{BL,i}</i>	<i>Average vehicular capacity of the transportation vehicle of type i</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Baseline Survey Report/13/ with historical data available with local sludge transport vehicle specifications
Correct value provided?	Yes – 5 tonnes/trip
Has this value been verified?	Yes. The value is confirmed in line with the historical data available in Baseline Survey Report/13/
Choice of data correctly justified?	Yes
Measurement method correctly described?	N/A

CAR 20, CAR 21 and CAR 22 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

2. Data and Parameters Monitored

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

<i>Q_{PJ,ww,m}</i> and <i>Q_{PJ,ww,i}</i>	<i>Quantity of wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m and in day i, respectively</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of the both values of each plant
Data unit correctly expressed?	Yes – m ³
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- <i>Q_{PJ,ww,m}</i> and <i>Q_{PJ,ww,i}</i> were monitored by monitoring staffs in 16 wastewater treatment plants continuously and integrated monthly for calculations. Via site inspection, CTI confirmed that there is one electromagnetic flowmeter converter installed in front of pre-treatment process of each treatment plant. The monitoring staffs in plants will record the flow of the wastewater daily and integrated monthly for calculations, all the data were recorded in the Flow rate operation statistics of wastewater/20/. The ex-ante values are derived from Feasibility Study Report/5/. <i>Q_{PJ,ww,i}</i> is maximum design influent flow, <i>Q_{PJ,ww,m}</i> is obtained by multiplying <i>Q_{PJ,ww,i}</i> by the number of days in the corresponding month.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Feasibility Study Report/5/.

Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - The calibration of electromagnetic flowmeter converters, including the frequency of calibration, should be done once three years in accordance with national standards or requirements.
Monitoring frequency correctly described?	Parameter monitored continuously and integrated monthly or daily for calculations - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - electromagnetic flowmeter converters
QA/QC procedure correctly described?	Yes
Purpose of data?	PE calculation

$W_{PJ,COD,ww,m}$ and $W_{PJ,COD,ww,i}$	<i>Average chemical oxygen demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m and in day i, respectively</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of the both values of each plant
Data unit correctly expressed?	Yes –tCOD/m ³
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $W_{PJ,COD,ww,m}$ and $W_{PJ,COD,ww,i}$ will be monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations. Via site inspection, CTI confirmed that there is one COD_{cr} water quality online automatic monitor installed in each treatment plant. The unit of Influent COD concentration is mg/L, the unit of $W_{PJ,COD,ww,i}$ is t/m³, so $W_{PJ,COD,ww,i}$ can be obtained by dividing Influent COD concentration by 1,000,000 through unit conversion. The monitoring staffs in plants will record the COD values every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations, all the data will be recorded in the COD operation statistics of wastewater/21/. The ex-ante values are derived from Feasibility Study Report/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Feasibility Study Report/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - The calibration of COD _{cr} water quality online automatic monitors, including the frequency of calibration, should be done once a year in accordance with national standards or requirements.
Monitoring frequency correctly described?	Parameter monitored continuously and aggregated daily and monthly for calculations - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - COD _{cr} water quality online automatic monitors

QA/QC procedure correctly described?	Yes
Purpose of data?	PE calculation

$T_{2,m}$	<i>Average temperature at the project site in month m</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of values of 16 plants
Data unit correctly expressed?	Yes - K
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- Average temperature at the project site will be monitored by meteorological bureau of each town taken the measurement from on-site and issued the temperature monitoring report for the 16 wastewater treatment plants The ex-ante values are derived from Meteorological Bureau website/72/ for different cities where 16 plants located in
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Meteorological Bureau website/72/ for different cities where 16 plants located in
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - Average temperature at the project site will be monitored by meteorological bureau of each town taken the measurement from on-site and issued the temperature monitoring report for the 16 wastewater treatment plants
Monitoring frequency correctly described?	Parameter monitored continuously, aggregated in monthly average values - verified as per the applied methodology
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Yes – Ex-ante data source of this website is China Meteorological Administration, the China Meteorological Administration is the authority, and the China Meteorological Administration regularly calibrates and maintains the temperature monitoring equipment according to the national specifications. Ex-post on-site measurement of the temperature was conducted by meteorological bureau of each town as per the requirements of the applied methodology. The monthly average temperature of the 16 plants during this monitoring period was summarized in temperature monitoring report for the 16 wastewater treatment plants. The higher the average temperature, the larger the related baseline emissions. To get the conservative value of the average temperature, the results were cross-checked with the public statistics/78/.
Purpose of data?	BE and PE calculation

$Q_{PJ,effl,i}$ and $Q_{PJ,effl,m}$	<i>Quantity of effluent that leaves the aerobic wastewater treatment plant in the project activity in day i and month m, respectively</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of the both values of each plant
Data unit correctly expressed?	Yes – m ³
Appropriate description?	Yes

Source clearly referenced? (appropriate?)	Yes- $Q_{PJ,effl,i}$ and $Q_{PJ,effl,m}$ will be monitored by monitoring staffs in 16 wastewater treatment plants continuously and integrated monthly or daily for calculations. Via site inspection, CTI confirmed that there is one electromagnetic flowmeter converter installed after tertiary deep treatment process of each treatment plant. The monitoring staffs in plants will record the flow of the wastewater daily and integrated monthly for calculations, all the data will be recorded in the Flow rate operation statistics of wastewater/20/. The ex-ante values are derived from Feasibility Study Report/5/. $Q_{PJ,effl,i}$ is design effluent value that leaves the aerobic wastewater treatment plant in the project activity, $Q_{PJ,effl,m}$ is obtained by multiplying $Q_{PJ,effl,i}$ by the number of days in the corresponding month.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Feasibility Study Report/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - The calibration of electromagnetic flowmeter converters, including the frequency of calibration, should be done once three years in accordance with national standards or requirements.
Monitoring frequency correctly described?	Parameter monitored continuously and integrated monthly or daily for calculations - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - electromagnetic flowmeter converters
QA/QC procedure correctly described?	Yes
Purpose of data?	BE and PE calculation

$W_{PJ,COD,effl,m}$ and $W_{PJ,COD,effl,i}$	<i>Average chemical oxygen demand in the effluent that leaves the aerobic wastewater treatment plant in the project activity in day i and month m, respectively</i>
Title in line with Methodology?	Yes
Ex-ante Value	$W_{PJ,COD,effl,m} = W_{PJ,COD,effl,i} = 0.000040$
Data unit correctly expressed?	Yes - $tCOD/m^3$
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $W_{PJ,COD,effl,m}$ and $W_{PJ,COD,effl,i}$ will be monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations.. Via site inspection, CTI confirmed that there is one COD_{cr} water quality online automatic monitor installed in each treatment plant. The unit of Influent COD concentration is mg/L, the unit of $W_{PJ,COD,effl,i}$ is t/m^3, so $W_{PJ,COD,effl,i}$ can be obtained by dividing Influent COD concentration by 1,000,000 through unit conversion. The monitoring staffs in plants will record the COD values every two hours and the average daily COD was calculated based on

	the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations, all the data will be recorded in the COD operation statistics of wastewater/21/. The ex-ante values are derived from Feasibility Study Report/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Feasibility Study Report/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - The calibration of COD _{cr} water quality online automatic monitors, including the frequency of calibration, should be done once a year in accordance with national standards or requirements.
Monitoring frequency correctly described?	Parameter monitored continuously and aggregated daily and monthly for calculations - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - COD _{cr} water quality online automatic monitors
QA/QC procedure correctly described?	Yes
Purpose of data?	PE calculation

<i>f_{PJ,d,y}</i>	<i>Factor expressing the influence of the depth on methane generation in year y</i>
Title in line with Methodology?	Yes
Ex-ante Value	0
Data unit correctly expressed?	Yes - %
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- according to the applied methodology, Apply the following values for the corresponding average depth: Depth > 5 m: 70% Depth 1 – 5 m: 50% Depth < 1 m: 0% Via site inspection and checking the FSR/5/, CTI confirmed that effluent from each wastewater treatment plant is discharged through the sewage pipe, and the diameter of the pipe is less than 1 m in general. The ex-ante value of the depth is derived from FSR/5/. Furthermore, via checking the Technical Construction Plan for Wastewater Treatment Plant which refer to the Standard for design of outdoor wastewater engineering/80/, it is confirmed that the design depth of the effluent channels of the 16 wastewater treatment plants should be not more than 1m.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante value 0% is derived from FSR/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – Due to the design depth of the effluent channels of the 16 wastewater treatment plants is not more than 1m, so there is no need for monitoring equipment for the effluent channel
Monitoring frequency correctly described?	N/A
Monitoring equipment correctly described?	N/A

QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation

$Q_{PJ,sl,y}$	<i>Quantity of sludge produced in the project activity in the year y</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of the value of each plant
Data unit correctly expressed?	Yes - tonnes
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $Q_{PJ,sl,y}$ will be monitored by monitoring staffs in 16 wastewater treatment plants daily and average yearly values for calculations. The ex-ante values are derived from Feasibility Study Report/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Feasibility Study Report/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes - Via site inspection, CTI confirmed that there is one weighbridge installed after the sludge treatment process of each treatment plant. The monitoring staffs in plants will record the quantity of sludge produced daily and integrated yearly for calculations, all the data will be recorded in the sludge statistics of wastewater/22/.
Monitoring frequency correctly described?	Parameter monitored continuously and aggregated yearly for calculations - verified as per the applied methodology
Monitoring equipment correctly described?	Yes - weighbridges
QA/QC procedure correctly described?	Yes - The calibration of weighbridges, including the frequency of calibration, should be done annually in accordance with national standards or requirements.
Purpose of data?	PE calculation

$DP_{J,i,y}$	<i>Average distance per trip travelled by the transportation vehicle of type i for transportation of sludge generated by the wastewater treatment system in the project activity in the year y</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of values
Data unit correctly expressed?	Yes - km
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $DP_{J,i,y}$ will be monitored. The distance of sludge transportation between the wastewater treatment plants and landfills will be determined by online On-Board Diagnostics installed in sludge transport vehicle. The monitoring team of the wastewater treatment plant will be responsible for exporting and recording the data from online On-Board Diagnostics every year, this data will be recorded in the fuel consumption record book of sludge transport vehicle/23/. The ex-ante values are derived from FSR/5/ which are monitored by local government and derived from document of local official investigation. The local government conducted on-site measurements on the distance between the wastewater treatment plants and the landfills.

Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from FSR/5/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – The actual distance will come from the fuel consumption record book of sludge transport vehicle/23/ taken from online On-Board Diagnostics every year
Monitoring frequency correctly described?	Once a year
Monitoring equipment correctly described?	Online On-Board Diagnostics
QA/QC procedure correctly described?	Yes – The distances shown in the Sludge Disposal Letter/14/ will be used as cross-check.
Purpose of data?	PE calculation

$F_{PJ,i}$	<i>Specific fuel consumption of the transportation vehicle of type i</i>
Title in line with Methodology?	Yes
Ex-ante Value	0.251
Data unit correctly expressed?	Yes - Liter/km
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $F_{PJ,i}$ will be monitored. The fuel consumption of the transportation vehicle of 16 wastewater plants will be determined by online On-Board Diagnostics installed in sludge transport vehicle. The monitoring team of the wastewater treatment plant will be responsible for exporting and recording the data from the online On-Board Diagnostics installed in sludge transport vehicle, this data will be recorded in the fuel consumption record book of sludge transport vehicle/23/. The ex-ante values are derived from Table 1 in Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel, >4 tonne <8 tonne)/39/
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel, >4 tonne <8 tonne)/39/
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –Fuel consumption of the transportation vehicle of 16 wastewater plants will be measured by the online On-Board Diagnostics installed in sludge transport vehicle.
Monitoring frequency correctly described?	Once every three years
Monitoring equipment correctly described?	Online On-Board Diagnostics
QA/QC procedure correctly described?	Yes – The data which comes from the guideline for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel, >4 tonne <8 tonne) /39/ will be used as cross-check. And the larger data will be used as an ex-post calculation because it is more conservative.
Purpose of data?	PE calculation

$NCV_{PJ,j,y}$ and $EF_{PJ,j,y}$	<i>Respectively: net calorific value of the transportation fuel j, and CO₂ emission factor of the transportation fuel j in the year</i>
Title in line with Methodology?	Yes
Ex-ante Value	$NCV_{PJ,j,y} = 0.04333$ TJ/tonne $EF_{PJ,j,y} = 74.1$ tCO ₂ /TJ
Data unit correctly expressed?	Yes - Respectively: TJ/mass or volume units, and tCO ₂ /T
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $NCV_{PJ,j,y}$ and $EF_{PJ,j,y}$ will be derived from the default values due to the parameters can't be monitored by on-site measurement due to technical conditions' limitation. The ex-ante values $NCV_{PJ,j,y}$ is from Table 2 in Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel) /39/, $EF_{PJ,j,y}$ is from IPCC 2006 Vol2 Ch3 table 3.2.1(The parameter $EF_{PJ,j,y}$ in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories remains unchanged relative to IPCC 2006)/40/
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from default values available in Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel) /39/ and IPCC/40/.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – The default values will be used
Monitoring frequency correctly described?	Once a year
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	The values are valid for this monitoring period
Purpose of data?	PE calculation

$q_{PJ,i}$	<i>Average vehicular capacity of the transportation vehicle of type i</i>
Title in line with Methodology?	Yes
Ex-ante Value	5
Data unit correctly expressed?	Yes - tonnes/trip
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- $q_{PJ,i}$ will be monitored by monitoring staffs daily, the 16 wastewater treatment plants have vehicles specially used for sludge transportation and data will be derived from sludge statistics of wastewater/22/. The ex-ante values are derived from FSR/5/
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are derived from FSR/5/
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes – The actual values will come from the sludge statistics of wastewater/22/, the monitoring team of the wastewater treatment plant will be responsible for monitoring and recording the data.

Monitoring frequency correctly described?	Once a day - verified as reasonable
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation

<i>EC_{Pj,j,y}</i>	<i>Quantity of electricity consumed by the project electricity consumption source j in year y</i>
Title in line with Methodology?	Yes
Ex-ante Value	Refer to JPM for details of values of 16 plants
Data unit correctly expressed?	Yes – MWh
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- EC _{Pj,j,y} will be monitored by electricity meters continuously and at least monthly recording by PP/25/. The ex-ante values are derived from FSR/5/.
Correct value provided?	Yes
Has this value been verified?	Yes - The ex-ante values are confirmed as reasonable.
Choice of data correctly justified?	Yes
Measurement method correctly described?	Yes –The electricity consumption will be measured by electricity meter installed at each wastewater treatment plant. The project owner has signed a power purchase agreement/24/ with the local grid company, and the reading of the meter will be recorded on time every month. At the end of each month, all electricity bills will be settled by the project owner and the local grid company, and all electricity consumption data are confirmed by the electricity bill will be provided by the grid company.
Monitoring frequency correctly described?	Continuous measurement and at least monthly recording - verified as per the applied tool
Monitoring equipment correctly described?	Yes - electricity meters
QA/QC procedure correctly described?	Yes - The calibration of electricity meters, including the frequency of calibration, should be done in accordance with national standard. The electricity consumption supplied by the grid company, then the value will be determined by the electricity meters monitoring and cross-check with the monthly electricity bills/26/.
Purpose of data?	PE calculation

<i>TDL_{j,y}</i>	<i>Average technical transmission and distribution losses for providing electricity to source j in year y</i>
Title in line with Methodology?	Yes
Ex-ante Value	20
Data unit correctly expressed?	Yes - %
Appropriate description?	Yes
Source clearly referenced? (appropriate?)	Yes- value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/44/
Correct value provided?	Yes
Has this value been verified?	Yes – default value of 20% is used, which is conservative
Choice of data correctly justified?	Yes

Measurement method correctly described?	Yes – value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/44/
Monitoring frequency correctly described?	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years - verified as per the tool
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation

3. Monitoring plan

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

The monitoring plan in the Joint-PD-MR has been designed to comply with the latest applicable version of the methodology (AM0080 version 01).

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

Monitoring framework:

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

Monitoring equipment and installation:

Measurement instruments are described in the monitoring plan as subject to appropriate national standards with respect to installation, accuracy and calibration interval. Main instruments electromagnetic flowmeter converters, COD_{Cr} water quality online automatic monitors, electricity meters, weighbridges, are used to monitor related parameters as assessed in the above tables of monitored parameters.

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

Parameters to be monitored:

Listed as above tables and assessed by VVB accordingly.

Quality assurance and quality control procedures:

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

Training:

Training will be provided to relevant personnel/32/.

Data management:

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

Corrective actions:

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

In conclusion, the implementation of monitoring plan including monitoring, data recording and collection, QA/QC procedure, emergency procedure is stated by PP which is confirmed as actual and reasonable by site inspection and interview with the chief of farms and monitoring team. The same monitoring activity of will be conducted in the 16 wastewater treatment plants during each monitoring periods.

CAR 23, CAR 24, CAR 25, CAR 26, CAR 27, CAR 28, CAR 29 and CAR 30 were raised and successfully closed. Refer to Appendix 4 for detail assessment.

3.5 Non-Permanence Risk Analysis

N/A

4 VERIFICATION FINDINGS

4.1 Project Implementation Status

Through the onsite visit, interviewing the project developer and reviewing the project description in Joint-PD-MR/1/, it was confirmed that the project including 16 wastewater treatment plants, of which the main purpose is to reduce environmental pollution and destroy methane emissions from the open anaerobic lagoons in baseline scenario, the best available low-cost solution for wastewater treatment. The wastewater is composed of residents' domestic wastewater within the service area.

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

The verifier has performed a site visit to check the project equipment and interview with staffs from 16 wastewater treatment plants, in addition by all the provided evidence, it is found that the project implemented 16 wastewater treatment plants mainly include pre-treatment process, secondary biological treatment process, tertiary deep treatment process and sludge treatment process, with total maximum design influent flow of 175,150 m³/d.

The project started construction on 02-July-2019 (for Bomei Town wastewater Treatment Plant) which has been confirmed by checking the General design and construction contract/10/, and started first commissioning on 18-August-2020 and started first operation on 03-September-2020 (for Xinyi City Dinbao Town wastewater treatment Plant) which has been confirmed by checking the operation log of the project/13/ and statement of all the plants started construction and operation/12/. The factors and parameters used during this monitoring period to arrive at the emission reduction calculations are transparently described in the Joint-PD-MR/1/.

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

This verification covers the period from 03-September-2020 to 30-June-2022 (including both days). 110,002 tCO₂e emission reductions are claimed as VCUs during this monitoring period.

CAR 31 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

4.2 Accuracy of GHG Emission Reduction and Removal Calculations

1. Assessment of Data and parameters available at validation

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

2. Assessment of Data and parameters monitored

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

- (i) appropriateness of the applied measurement / determination method,
- (ii) the correctness of the values applied for ER calculation,
- (iii) the accuracy, and applied QA/QC measures.

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

$Q_{PJ,ww,m}$ and $Q_{PJ,ww,i}$	<i>Quantity of wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m and in day i, respectively</i>																														
Title in line with Methodology?	Yes																														
Data unit correctly expressed?	Yes –m ³																														
Appropriate description?	Yes																														
Monitored Value?	Refer to JPM for details of the both values of each plant																														
Correct value provided?	Yes																														
Source clearly referenced? (appropriate?)	Yes – $Q_{PJ,ww,m}$ and $Q_{PJ,ww,i}$ were monitored by monitoring staffs in 16 wastewater treatment plants continuously and integrated monthly for calculations. Via site inspection, CTI confirmed that there is one electromagnetic flowmeter converter installed in front of pre-treatment process of each treatment plant. The monitoring staffs in plants will record the flow of the wastewater daily and integrated monthly for calculations, all the data will be recorded in the Flow rate operation statistics of wastewater/20/.																														
Choice of data correctly justified?	Yes –The measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.																														
Measurement method and procedures correctly described?	Yes –Data were recorded by monitoring staffs in plants daily and integrated monthly for calculations, all the data were recorded in the Flow rate operation statistics of wastewater/20/. Above mentioned evidences were provided to the VVB during site verification. Via comparing the data in Joint-PD-MR with the evidence, CTI verified that the data in Joint-PD-MR is correct.																														
Calculation method?	N/A																														
Monitoring frequency correctly described?	Monitored continuously and integrated monthly or daily for calculations																														
Monitoring equipment correctly described?	16 electromagnetic flowmeter converters installed at all plants Accuracy: 0.001m³/h Type: SEAGMA LDG250-BSYZ5 The calibration information and validity is listed as below table <table border="1"> <thead> <tr> <th>Location of plant</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr> </thead> <tbody> <tr> <td>Xiaqiao Town</td><td>Q-XQ-1</td><td rowspan="11">27-August-2020 26-August-2021</td><td rowspan="11">26-August-2021 25-August-2022</td></tr> <tr> <td>Qujie Town</td><td>Q-QJ-1</td></tr> <tr> <td>Dinbao Town</td><td>Q-DB-1</td></tr> <tr> <td>Qianpai Town</td><td>Q-QP-1</td></tr> <tr> <td>Xianqiao South</td><td>Q-XQN-1</td></tr> <tr> <td>Qiankeng Town</td><td>Q-QK-1</td></tr> <tr> <td>Shangsha Town</td><td>Q-SS-1</td></tr> <tr> <td>Baita Town</td><td>Q-BT-1</td></tr> <tr> <td>Luoding</td><td>Q-LD-1</td></tr> <tr> <td>Shitan Town</td><td>Q-ST-1</td></tr> <tr> <td>Litan Town</td><td>Q-LT-1</td></tr> </tbody> </table>			Location of plant	Serial No.	Calibrated Date	Validity	Xiaqiao Town	Q-XQ-1	27-August-2020 26-August-2021	26-August-2021 25-August-2022	Qujie Town	Q-QJ-1	Dinbao Town	Q-DB-1	Qianpai Town	Q-QP-1	Xianqiao South	Q-XQN-1	Qiankeng Town	Q-QK-1	Shangsha Town	Q-SS-1	Baita Town	Q-BT-1	Luoding	Q-LD-1	Shitan Town	Q-ST-1	Litan Town	Q-LT-1
Location of plant	Serial No.	Calibrated Date	Validity																												
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	jiulong Town	Q-JL-1		
	Shakou Town	Q-SK-1		
	Bomei Town	Q-BM-1		
	Nantang Town	Q-NT-1		
	Chikeng Town	Q-CK -1		
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG1033-2007 “Verification Regulation of electromagnetic flowmeter converter” in China/36/.			
Purpose of data?	PE calculation			
Comments?	N/A			

$W_{PJ,COD,ww,m}$ and $W_{PJ,COD,ww,i}$	Average chemical oxygen demand in the wastewater that is treated in the aerobic wastewater treatment plant in the project activity in month m and in day i, respectively						
Title in line with Methodology?	Yes						
Data unit correctly expressed?	Yes -tCOD/m ³						
Appropriate description?	Yes						
Monitored Value?	Refer to JPM for details of the both values of each plant						
Correct value provided?	Yes						
Source clearly referenced? (appropriate?)	Yes - $W_{PJ,COD,ww,m}$ and $W_{PJ,COD,ww,i}$ are monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations. Via site inspection, CTI confirmed that there is one COD_{cr} water quality online automatic monitor installed in each treatment plant. The unit of Influent COD concentration is mg/L, the unit of $W_{PJ,COD,ww,i}$ is t/m³, so $W_{PJ,COD,ww,i}$ can be obtained by dividing Influent COD concentration by 1,000,000 through unit conversion. The monitoring staffs in plants records the COD values every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations, all the data are recorded in the COD operation statistics of wastewater/21/.						
Choice of data correctly justified?	Yes -The measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.						
Measurement method and procedures correctly described?	Yes -Data were monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations. Above mentioned evidences/21/ were provided to the verification team during site verification. Via comparing the data in Joint-PD-MR with the evidence, CTI verified that the data in Joint-PD-MR is correct.						
Calculation method?	N/A						
Monitoring frequency correctly described?	Monitored continuously and aggregated daily and monthly for calculations						
Monitoring equipment correctly described?	16 COD_{cr} water quality online automatic monitor installed at all plants Accuracy: 0.1mg/L Type: ZHYQ3059 The calibration information and validity is listed as below table <table> <tr> <th>Location of plant</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr> </table>			Location of plant	Serial No.	Calibrated Date	Validity
Location of plant	Serial No.	Calibrated Date	Validity				

	Xiaqiao Town In-COD-XQ-1 Qujie Town In-COD -QJ-1 Dinbao Town In-COD -DB-1 Qianpai Town In-COD -QP-1 Xianqiao South In-COD -XQN-1 Qiankeng Town In-COD-QK-1 Shangsha Town In-COD-SS-1 Baita Town In-COD-BT-1 Luoding In-COD-LD-1 Shitan Town In-COD-ST-1 Litan Town In-COD-LT-1 jiulong Town In-COD-JL-1 Shakou Town In-COD-SK-1 Bomei Town In-COD-BM-1 Nantang Town In-COD-NT-1 Chikeng Town In-COD-CK -1	29-August-2020 28-August-2021	28-August-2021 27-August-2022
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG1012-2019 "Verification Regulation of COD _{cr} water quality online automatic monitor"/37/.		
Purpose of data?	PE calculation		
Comments?	N/A		

$T_{2,m}$	<i>Average temperature at the project site in month m</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes – K
Appropriate description?	Yes
Monitored Value?	Refer to JPM for details of values of 16 plants
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes–Average temperature at the project site was monitored by meteorological bureau of each town taken the measurement from on-site and issued the monthly average temperature monitoring report/79/ of the 16 plants during this monitoring period
Choice of data correctly justified?	Yes – The measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.
Measurement method and procedures correctly described?	Yes –This parameter is monitored by meteorological bureau of each town taken the measurement from on-site and issued the monthly average temperature monitoring report/79/ of the 16 plants during this monitoring period
Calculation method?	N/A
Monitoring frequency correctly described?	Monitored continuously, aggregated in monthly average values
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	Above mentioned evidences were provided to the verification team during site verification. Via comparing the data in public statistics/78/, CTI verified that the data in Joint-PD-MR is correct and conservative.
Purpose of data?	BE and PE calculation
Comments?	-

$Q_{PJ,effl,i}$ and $Q_{PJ,effl,m}$	<i>Quantity of effluent that leaves the aerobic wastewater treatment plant in the project activity in day i and month m, respectively</i>
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Title in line with Methodology?	Yes																																						
Data unit correctly expressed?	Yes –m ³																																						
Appropriate description?	Yes																																						
Monitored Value?	Refer to JPM for details of the both values of each plant																																						
Correct value provided?	Yes																																						
Source clearly referenced? (appropriate?)	Yes – $Q_{PJ,ww,m}$ and $Q_{PJ,ww,i}$ were monitored by monitoring staffs in 16 wastewater treatment plants continuously and integrated monthly for calculations. Via site inspection, CTI confirmed that there is one electromagnetic flowmeter converter installed at the effluent channel of the wastewater plant. The monitoring staffs in plants will record the flow of the wastewater daily and integrated monthly for calculations, all the data will be recorded in the Flow rate operation statistics of wastewater/20/.																																						
Choice of data correctly justified?	Yes –The measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.																																						
Measurement method and procedures correctly described?	Yes –Data were recorded by monitoring staffs in plants daily and integrated monthly for calculations, all the data were recorded in the Flow rate operation statistics of wastewater/20/. Above mentioned evidences were provided to the VVB during site verification. Via comparing the data in Joint-PD-MR with the evidence, CTI verified that the data in Joint-PD-MR is correct.																																						
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Bomei Town	Q-BM-2																																						
Nantang Town	Q-NT-2																																						
Chikeng Town	Q-CK -2																																						
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG1033-2007" Verification Regulation of electromagnetic flowmeter converter" in China/36/.																																						
Purpose of data?	PE calculation																																						
Comments?	N/A																																						

$W_{PJ,COD,effl,m}$ and $W_{PJ,COD,effl,i}$	Average chemical oxygen demand in the effluent that leaves the aerobic wastewater treatment plant in the project activity in day i and month m , respectively																																		
Title in line with Methodology?	Yes																																		
Data unit correctly expressed?	Yes –tCOD/m ³																																		
Appropriate description?	Yes																																		
Monitored Value?	Refer to JPM for details of the both values of each plant																																		
Correct value provided?	Yes																																		
Source clearly referenced? (appropriate?)	Yes – $W_{PJ,COD,effl,m}$ and $W_{PJ,COD,effl,i}$ are monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations. Via site inspection, CTI confirmed that there is one COD_{cr} water quality online automatic monitor installed in each treatment plant. The unit of Influent COD concentration is mg/L, the unit of $W_{PJ,COD,effl,i}$ is t/m³, so $W_{PJ,COD,effl,i}$ can be obtained by dividing Influent COD concentration by 1,000,000 through unit conversion. The monitoring staffs in plants records the COD values every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations, all the data are recorded in the COD operation statistics of wastewater/21/.																																		
Choice of data correctly justified?	Yes –The measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.																																		
Measurement method and procedures correctly described?	Yes –Data were monitored by monitoring staffs in 16 wastewater treatment plants once every two hours and the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values are used for calculations. Above mentioned evidences/21/ were provided to the verification team during site verification. Via comparing the data in Joint-PD-MR with the evidence, CTI verified that the data in Joint-PD-MR is correct.																																		
Calculation method?	N/A																																		
Monitoring frequency correctly described?	Monitored continuously and aggregated daily and monthly for calculations																																		
Monitoring equipment correctly described?	16 COD_{cr} water quality online automatic monitor installed at all plants Accuracy: 0.1mg/L Type: ZHYQ3059 The calibration information and validity is listed as below table <table><tr><th>Location of plant</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr><tr><td>Xiaqiao Town</td><td>Out-COD-XQ-1</td><td rowspan="13">25-August-2020 24-August-2021</td><td rowspan="13">24-August-2021 23-August-2022</td></tr><tr><td>Qujie Town</td><td>Out-COD-QJ-1</td></tr><tr><td>Dinbao Town</td><td>Out-COD-DB-1</td></tr><tr><td>Qianpai Town</td><td>Out-COD-QP-1</td></tr><tr><td>Xianqiao South</td><td>Out-COD-XQN-1</td></tr><tr><td>Qiankeng Town</td><td>Out-COD-QK-1</td></tr><tr><td>Shangsha Town</td><td>Out-COD-SS-1</td></tr><tr><td>Baita Town</td><td>Out-COD-BT-1</td></tr><tr><td>Luoding</td><td>Out-COD-LD-1</td></tr><tr><td>Shitan Town</td><td>Out-COD-ST-1</td></tr><tr><td>Litan Town</td><td>Out-COD-LT-1</td></tr><tr><td>jiulong Town</td><td>Out-COD-JL-1</td></tr><tr><td>Shakou Town</td><td>Out-COD-SK-1</td></tr></table>			Location of plant	Serial No.	Calibrated Date	Validity	Xiaqiao Town	Out-COD-XQ-1	25-August-2020 24-August-2021	24-August-2021 23-August-2022	Qujie Town	Out-COD-QJ-1	Dinbao Town	Out-COD-DB-1	Qianpai Town	Out-COD-QP-1	Xianqiao South	Out-COD-XQN-1	Qiankeng Town	Out-COD-QK-1	Shangsha Town	Out-COD-SS-1	Baita Town	Out-COD-BT-1	Luoding	Out-COD-LD-1	Shitan Town	Out-COD-ST-1	Litan Town	Out-COD-LT-1	jiulong Town	Out-COD-JL-1	Shakou Town	Out-COD-SK-1
Location of plant	Serial No.	Calibrated Date	Validity																																
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Shakou Town	Out-COD-SK-1																																		

	Bomei Town	Out-COD-BM-1		
	Nantang Town	Out-COD-NT-1		
	Chikeng Town	Out-COD-CK-1		
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG1012-2019" Verification Regulation of COD _{cr} water quality online automatic monitor"/37/.			
Purpose of data?	PE calculation			
Comments?	N/A			

<i>f_{PJ,d,y}</i>	<i>Factor expressing the influence of the depth on methane generation in year y</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes – %
Appropriate description?	Yes
Monitored Value?	0%
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – Apply the following values for the corresponding average depth: Depth > 5 m: 70% Depth 1 – 5 m: 50% Depth < 1 m: 0% Via site inspection and checking the FSR/5/, CTI confirmed that effluent from each wastewater treatment plant is discharged through the sewage pipe, and the diameter of the pipe is less than 1 m in general. Furthermore, via checking the Technical Construction Plan for Wastewater Treatment Plant which refer to the Standard for design of outdoor wastewater engineering/80/, it is confirmed that the design depth of the effluent channels of the 16 wastewater treatment plants should be not more than 1m.
Choice of data correctly justified?	Yes – the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.
Measurement method and procedures correctly described?	Yes –Due to the design depth of the effluent channels of the 16 wastewater treatment plants is not more than 1m, so there is no need for monitoring equipment for the effluent channel.
Calculation method?	N/A
Monitoring frequency correctly described?	N/A
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	N/A

<i>Q_{PJ,sl,y}</i>	<i>Quantity of sludge produced in the project activity in the year y</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Yes –tonnes
Appropriate description?	Yes
Monitored Value?	Refer to JPM for details of the value of each plant
Correct value provided?	Yes

Source clearly referenced? (appropriate?)	Yes – $Q_{PJ,sl,y}$ was monitored by monitoring staffs in 16 wastewater treatment plants daily and average yearly values for calculations.																																									
Choice of data correctly justified?	Yes – the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.																																									
Measurement method and procedures correctly described?	Yes –Via site inspection, CTI confirmed that there is one weighbridge installed after the sludge treatment process of each treatment plant. The monitoring staffs in plants records the quantity of sludge produced daily and integrated yearly for calculations, all the data are recorded in the sludge statistics of wastewater/22/.																																									
Calculation method?	N/A																																									
Monitoring frequency correctly described?	Monitored continuously and aggregated yearly for calculations																																									
Monitoring equipment correctly described?	16 electromagnetic weighbridges installed at all plants Accuracy: 10kg Type: SCS-50t/10kg The calibration information and validity is listed as below table <table><tr><th>Location of plant</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr><tr><td>Xiaqiao Town</td><td>202006001</td><td rowspan="16">23-August-2020 22-August-2021</td><td rowspan="16">22-August-2021 21-August-2022</td></tr><tr><td>Qujie Town</td><td>202006002</td></tr><tr><td>Dinbao Town</td><td>202006003</td></tr><tr><td>Qianpai Town</td><td>202006004</td></tr><tr><td>Xianqiao South</td><td>202006005</td></tr><tr><td>Qiankeng Town</td><td>202006006</td></tr><tr><td>Shangsha Town</td><td>202006007</td></tr><tr><td>Baita Town</td><td>202006008</td></tr><tr><td>Luoding</td><td>202006009</td></tr><tr><td>Shitan Town</td><td>202006010</td></tr><tr><td>Litan Town</td><td>202006011</td></tr><tr><td>jiulong Town</td><td>202006012</td></tr><tr><td>Shakou Town</td><td>202006013</td></tr><tr><td>Bomei Town</td><td>202006014</td></tr><tr><td>Nantang Town</td><td>202006015</td></tr><tr><td>Chikeng Town</td><td>202006016</td></tr></table>				Location of plant	Serial No.	Calibrated Date	Validity	Xiaqiao Town	202006001	23-August-2020 22-August-2021	22-August-2021 21-August-2022	Qujie Town	202006002	Dinbao Town	202006003	Qianpai Town	202006004	Xianqiao South	202006005	Qiankeng Town	202006006	Shangsha Town	202006007	Baita Town	202006008	Luoding	202006009	Shitan Town	202006010	Litan Town	202006011	jiulong Town	202006012	Shakou Town	202006013	Bomei Town	202006014	Nantang Town	202006015	Chikeng Town	202006016
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Qiankeng Town	202006006																																									
Shangsha Town	202006007																																									
Baita Town	202006008																																									
Luoding	202006009																																									
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Bomei Town	202006014																																									
Nantang Town	202006015																																									
Chikeng Town	202006016																																									
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG 539-2016 “Verification Regulation of weighbridge”/38/.																																									
Purpose of data?	PE calculation																																									
Comments?	-																																									

$DP_{I,i,y}$	<i>Average distance per trip travelled by the transportation vehicle of type i for transportation of sludge generated by the wastewater treatment system in the project activity in the year y</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	km
Appropriate description?	Yes
Monitored Value?	Refer to JPM for details of values
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes - $DP_{I,i,y}$ is monitored. The distance of sludge transportation between the wastewater treatment plants and landfills is determined by online On-Board Diagnostics installed in sludge transport vehicle.
Choice of data correctly justified?	Yes

Measurement method and procedures correctly described?	Yes -The monitoring team of the wastewater treatment plant is responsible for exporting and recording the data from online On-Board Diagnostics every year, this data are recorded in the fuel consumption record book of sludge transport vehicle/23/.
Calculation method?	N/A
Monitoring frequency correctly described?	Once a year
Monitoring equipment correctly described?	Online On-Board Diagnostics installed in sludge transport vehicle
QA/QC procedure correctly described?	Yes - The distances shown in the Sludge Disposal Letter/14/ has been used as cross-check with fuel consumption record book of sludge transport vehicle/23/ and CTI confirmed that the larger values have been selected by PP for PE calculation which is verified as conservative.
Purpose of data?	PE calculation
Comments?	-

$F_{PJ,i}$	<i>Specific fuel consumption of the transportation vehicle of type i</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Liter/km
Appropriate description?	Yes
Monitored Value?	0.251
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – $F_{PJ,i}$ is monitored. The fuel consumption of the transportation vehicle of 16 wastewater plants will be determined by online On-Board Diagnostics installed in sludge transport vehicle.
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.
Measurement method and procedures correctly described?	Yes -The monitoring team of the wastewater treatment plant will be responsible for exporting and recording the data from the online On-Board Diagnostics installed in sludge transport vehicle, this data will be recorded in the fuel consumption record book of sludge transport vehicle/23/.
Calculation method?	N/A
Monitoring frequency correctly described?	Once every three years
Monitoring equipment correctly described?	Online On-Board Diagnostics installed in sludge transport vehicle
QA/QC procedure correctly described?	Yes -The data which comes from the guideline for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel, >4 tonne <8 tonne) /39/ has been used as cross-check. And the larger data have been used for PE calculation which is verified as conservative.
Purpose of data?	PE calculation
Comments?	-

$NCV_{PJ,j,y}$ and $EF_{PJ,j,y}$	<i>Respectively: net calorific value of the transportation fuel j, and CO₂ emission factor of the transportation fuel j in the year</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	Respectively: TJ/mass or volume units, and tCO ₂ /T
Appropriate description?	Yes
Monitored Value?	$NCV_{PJ,j,y} = 0.04333$ TJ/tonne

	$EF_{PJ,j,y} = 74.1 \text{ tCO}_2/\text{TJ}$
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – $NCV_{PJ,j,y}$ and $EF_{PJ,j,y}$ are derived from the default values due to the parameters can't be monitored by on-site measurement due to technical conditions' limitation.
Choice of data correctly justified?	Yes - default values from Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises (Diesel) /39/ and IPCC/40/ are used.
Measurement method and procedures correctly described?	Yes – default values used
Calculation method?	N/A
Monitoring frequency correctly described?	Once a year
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A, as the value are default values.
Purpose of data?	PE calculation
Comments?	-

$q_{PJ,i}$	Average vehicular capacity of the transportation vehicle of type i
Title in line with Methodology?	Yes
Data unit correctly expressed?	tonnes/trip
Appropriate description?	Yes
Monitored Value?	5
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – $q_{PJ,i}$ is monitored by monitoring staffs daily, the 16 wastewater treatment plants have vehicles specially used for sludge transportation and data will be derived from sludge statistics of wastewater/22/.
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.
Measurement method and procedures correctly described?	Yes – The actual values come from the sludge statistics of wastewater/22/, the monitoring team of the wastewater treatment plant is responsible for monitoring and recording the data.
Calculation method?	N/A
Monitoring frequency correctly described?	Once a day
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	-

$EC_{PJ,j,y}$	Quantity of electricity consumed by the project electricity consumption source j in year y
Title in line with Methodology?	Yes
Data unit correctly expressed?	MWh
Appropriate description?	Yes
Monitored Value?	Refer to JPM for details of values of 16 plants

Correct value provided?	Yes																																									
Source clearly referenced? (appropriate?)	Yes– Value is monitored by electricity meters continuously and at least monthly recording by PP/25/.																																									
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.																																									
Measurement method and procedures correctly described?	Yes –The electricity consumption was measured by electricity meter installed at each wastewater treatment plant.																																									
Calculation method?	N/A																																									
Monitoring frequency correctly described?	Continuous measurement and at least monthly recording																																									
Monitoring equipment correctly described?	16 electricity meters installed at each treatment plant Accuracy: 0.5s Type: DTSK341-Z For meter, the calibration information and validity is listed as below table <table><tr><th>Farm</th><th>Serial No.</th><th>Calibrated Date</th><th>Validity</th></tr><tr><td>Xiaqiao Town</td><td>03001SF00000271700097967</td><td rowspan="16">28-August-2020</td><td rowspan="16">27-August-2025</td></tr><tr><td>Qujie Town</td><td>03001SF00000211800071045</td></tr><tr><td>Dinbao Town</td><td>03001SF00000211800078357</td></tr><tr><td>Qianpai Town</td><td>03001SF00000271700098940</td></tr><tr><td>Xianqiao South</td><td>03001SF00000211800081023</td></tr><tr><td>Qiankeng Town</td><td>03001SF00000271700098465</td></tr><tr><td>Shangsha Town</td><td>03001SF00000211800078357</td></tr><tr><td>Baita Town</td><td>03001SF00000271700095957</td></tr><tr><td>Luoding</td><td>03001SF00000271700095625</td></tr><tr><td>Shitan Town</td><td>03001SF00000221900061146</td></tr><tr><td>Litan Town</td><td>03001SF00000211800071045</td></tr><tr><td>jiulong Town</td><td>03001SF00000271700095957</td></tr><tr><td>Shakou Town</td><td>03001SF00000271700026321</td></tr><tr><td>Bomei Town</td><td>03001SF00000231500061245</td></tr><tr><td>Nantang Town</td><td>03001SF00000271700026321</td></tr><tr><td>Chikeng Town</td><td>03001SF00000271700095625</td></tr></table>				Farm	Serial No.	Calibrated Date	Validity	Xiaqiao Town	03001SF00000271700097967	28-August-2020	27-August-2025	Qujie Town	03001SF00000211800071045	Dinbao Town	03001SF00000211800078357	Qianpai Town	03001SF00000271700098940	Xianqiao South	03001SF00000211800081023	Qiankeng Town	03001SF00000271700098465	Shangsha Town	03001SF00000211800078357	Baita Town	03001SF00000271700095957	Luoding	03001SF00000271700095625	Shitan Town	03001SF00000221900061146	Litan Town	03001SF00000211800071045	jiulong Town	03001SF00000271700095957	Shakou Town	03001SF00000271700026321	Bomei Town	03001SF00000231500061245	Nantang Town	03001SF00000271700026321	Chikeng Town	03001SF00000271700095625
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Chikeng Town	03001SF00000271700095625																																									
QA/QC procedure correctly described?	Yes - The above calibration information has been confirmed by checking the calibration reports/18/ which has been conducted by qualified parties/19/ in compliance with JJG 596-2012” Electrical Meters for Measuring Alternating-current Electrical Energy”/34/. During this monitoring period, the electricity consumption of 16 plants were sourced from the grid company. Via checking the meter reading records/25/ comparing with Monthly electricity bills/26/, it is confirmed that the electricity consumed from power grid company is consistent.																																									
Purpose of data?	PE calculation																																									
Comments?	-																																									

<i>TDL_{j,y}</i>	<i>Average technical transmission and distribution losses for providing electricity to source j in year y</i>
Title in line with Methodology?	Yes
Data unit correctly expressed?	%
Appropriate description?	Yes

Monitored Value?	20%
Correct value provided?	Yes
Source clearly referenced? (appropriate?)	Yes – Value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/44/
Choice of data correctly justified?	Yes - the measuring and reporting frequency are in line with the monitoring plan and applied methodology/42/.
Measurement method and procedures correctly described?	Yes – Value is derived from “Baseline, project and/or leakage emissions from electricity consumption and monitoring of heat generation” (version 03.0)/44/ Default value of 20% is used, which is conservative
Calculation method?	N/A
Monitoring frequency correctly described?	Annually. In the absence of data from the relevant year, most recent figures should be used, but not older than 5 years - verified as per the tool
Monitoring equipment correctly described?	N/A
QA/QC procedure correctly described?	N/A
Purpose of data?	PE calculation
Comments?	-

CAR 32 was raised and successfully closed. Refer to Appendix 4 for detail assessment.

3. Assessment of GHG emission reductions Quantity

Calculation of baseline GHG emissions or removals

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

$$BE_y = BE_{CH_4,ww,y} + BE_{TR,sl,y}$$

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

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

Date	$BE_{CH_4,ww,y}$ (tCO _{2e} /yr)	$BE_{TR,sl,y}$ (tCO _{2e} /yr)	BE_y (tCO _{2e} /yr)
03-September-2020~31-December-2020	18,449	11.34	18,460
01-January-2021~31-December-2021	74,446	37.98	74,484
01-January-2022~30-June-2022	39,214	18.73	39,233
03-September-2020~30-June-2022	132,108	68.05	132,176

Total Baseline emissions of the 1st monitoring period is thus verified as **132,176** tCO_{2e}.

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

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

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

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

$$PE_y = PE_{EC,y} + PE_{TR,sl,y}$$

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

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

Date	PE _{EC,y} (tCO ₂ e)	PE _{TR,sl,y} (tCO ₂ e)	PE _y (tCO ₂ e)
03-September-2020~31-December-2020	3,760.26	61.4	3,832
01-January-2021~31-December-2021	12,000.84	204.96	12,212
01-January-2022~30-June-2022	5,993.40	101.92	6,105
03-September-2020~30-June-2022	21,754.51	368.28	22,149

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

Calculation of leakage GHG emissions

According to the methodology, the leakage emissions are not considered.

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

The VVB has checked the Joint-PD-MR includes a summary table of the emission reductions calculation.

Summary of emission reductions during the monitoring period,

$$ER_y = BE_y - PE_y - LE_y$$

Hence, the emission reductions during this monitoring period from 2020 to 2022 are summarized in the table below

Parameters	Baseline Emissions <i>BE_y</i>	Project Emissions <i>PE_y</i>	Leakage Emissions <i>LE_y</i>	Net GHG emission reductions or removals <i>ER</i>
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Period	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)
03-September-2020~31-December-2020	18,452	3,832	0	14,620
01-January-2021~31-December-2021	74,476	12,212	0	62,264
01-January-2022~30-June-2022	39,223	6,105	0	33,118
03-September-2020~30-June-2022	132,151	22,149	0	110,002

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

The comparison between the estimated and achieved emission reductions during the monitoring period has been conducted as below sheet,

Year	Ex-ante emissions reductions/removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
03-September-2020-31-December-2020	24,831	14,620	-41.12%	The achieved emission reductions during the monitoring period are confirmed lower than the estimated emission reductions in vintage year and total period.
01-January-2021-31-December-2021	83,296	62,264	-25.25%	
01-January-2022-30-June-2022	41,306	33,118	-19.82%	
Total: 03-September-2020-30-June-2022	149,433	110,002	-26.39%	Via site inspection and checking the monitoring data as listed in section 4.2 above, it is confirmed that the project's influent COD and flow do not reaching the design value, which is within a reasonable range of variation. In addition, the electricity consumption of the project is higher than the estimated value. Therefore, the actual emission reduction lower than the estimated value is verified as reasonable and there is no risk of great increase.

4.3 Quality of Evidence to Determine GHG Emission Reductions and Removals

Refer to section 4.1 above for the detail assessment of each monitoring parameters and Appendix 3 for the supporting evidence used to determine the GHG emission reductions.

For each reported data, the evidence is provided and verified as sufficient and quality is appropriate. Also, the cross-checks have been performed on the reported data with different source of evidence. The information flow from data generation and aggregation, to recording, calculation and final transposition into the monitoring report has been assessed by VVB in section 4.1 for each parameter and also the calibration have been conducted as per the frequency of monitoring equipment defined in the Joint-PD-MR.

Therefore, it is concluded that the evidence provided are verified as sufficient and quality is appropriate and thus the evidence can be used to determine the GHG emission reductions and removals for this monitoring period.

5 VALIDATION AND VERIFICATION CONCLUSION

Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd. has commissioned the CTI to carry out the Verified Carbon Standard (VCS) joint validation and 1st periodic verification of the project activity Yunshui Wastewater Treatment Plant Project in Guangdong Province (VCS ID 2938), for the monitoring period from 03-September-2020 to 30-June-2022, with regard to the relevant requirements for VCS Standard Version 4.3.

Based on the reviewing the documented evidence and by an on-site assessment, CTI can confirm that:

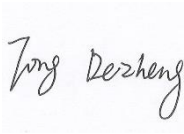
- the baseline scenario is correctly defined as per the applied methodology and relate tools;
- the project is additional;
- all data and information used for ex-ante calculation of emission reductions is of projected and/or hypothetical nature;
- the monitoring plan in the validated Joint-PD-MR is as per the applied baseline and monitoring methodology.
- the project has been implemented and operated as per the VCS Joint-PD-MR;
- the project complies with the validation and verification criteria for projects set out in VCS Standard Version 4.3;
- the monitoring report and other supporting documents provided are complete and verifiable and in accordance with the applicable VCS requirement and AM0080 (version 01);
- the monitoring is in place as per the applied baseline and monitoring methodology AM0080 (version 01);
- the monitoring complies with the monitoring plan in the validated PD;

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

Verification period: From 03-September-2020 to 30-June-2022

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

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
03-September-2020~31-December-2020	18,452	3,832	0	14,620
01-January-2021~31-December-2021	74,476	12,212	0	62,264
01-January-2022~30-June-2022	39,223	6,105	0	33,118
03-September-2020~30-June-2022	132,151	22,149	0	110,002



Tong Dezheng

CTI

Verification Team Leader

01-March-2023



Zhou Lu

CTI

Final Approval

01-March-2023

APPENDIX 1: ABBREVIATIONS

Abbreviations	Full texts
BE	Baseline Emission
CAR	Corrective Action Request
CCER	China Certified Emission Reduction
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CL	Clarification Request
CO ₂	Carbon dioxide
CP	Crediting Period
DNA	Designated National Authority
EB	Executive Board
EIA	Environmental Impact Assessment
ER	Emission Reduction
ETS	Emission Trading Scheme
FAR	Forward Action Request
PER	Feasibility Study Report
GHG	Green House Gas
GS	Gold Standard
GSC/GSP	Global Stakeholder Consultation Process
IPCC	Intergovernmental Panel on Climate Change
JPM	Joint-PD-MR
KP	Kyoto Protocol
LSC	Local Stakeholder Consultation
MoV	Means of Validation
MP	Monitoring Plan
ODA	Official Development Assistance
PA	Project Activity
PE	Project Emission
PP	Project Participant
PS	Project Standard
QC/QA	Quality control/Quality assurance
SCPG	South China Power Grid
SD	Sustainable Development
SDG	Sustainable Development Goals
tCO ₂ e	Tonnes of Carbon di oxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Validation and Verification Standard
VCS	Verified Carbon Standard
VCSA	Verified Carbon Standard Association
VCU	Verified Carbon Unit
VVB	Validation/Verification Body

APPENDIX 2: COMPETENCE OF TEAM MEMBERS AND TECHNICAL REVIEWERS

Mr. Dezheng TONG

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

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

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.2: Energy generation from renewable energy sources
SS 8: Mining/mineral production	TA 8.1: Mining/mineral production
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1: Fugitive emissions from oil and gas

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, 01/07/2022

Mr. Wenjun DU

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

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

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

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

Approved by:

Wu Lin

Wu LIN

Technical Competent Manager

Shenzhen, 01/01/2022

Mr. Wu LIN

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

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

Scope	Technical Area
SS 1: Energy industries (renewable/non-renewable sources)	TA 1.1: Thermal energy generation
	TA 1.2: Energy generation from renewable energy sources
SS 2: Energy distribution	TA 2.1: Electricity distribution
SS 3: Energy demand	TA 3.1: Energy demand
SS 4: Manufacturing industries	TA 4.1: Cement and lime production
SS 5: Chemical industry	TA 5.1: Chemical industry
	TA 5.2: Caprolactam, nitric and adipic acid
SS 10: Fugitive emissions from fuels (solid, oil and gas)	TA 10.1: Fugitive emissions from oil and gas
SS 11: Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	TA 11.1: Emissions of fluorinated gases
	TA 11.2: Refrigerant gas production
SS 12: Solvents use	TA 12.1: Chemical industry
SS 13: Waste handling and disposal	TA 13.1: Solid waste and wastewater
	TA 13.2: Manure

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

Approved by:



Lu ZHOU

General Manager

Shenzhen, 01/01/2021

APPENDIX 3: DOCUMENTS REVIEWED OR REFERENCED

No.	Author	Title	References to the document	Provider
1.	PP	Joint-PD-MR of “Yunshui Wastewater Treatment Plant Project in Guangdong Province”	- Draft Version No. 01, dated 02-July-2022 - Version No. 02, dated 31-August-2022 - Final Version No. 03, dated 20-February-2023	PP
2.	PP	Emission Reduction Calculation spreadsheet of “Yunshui Wastewater Treatment Plant Project in Guangdong Province” – Ex-ante calculation	- Draft Version No. 01, dated 02-July-2022 - Version No. 02, dated 31-August-2022 - Final Version No. 03, dated 18-February-2023	PP
		Emission Reduction Calculation spreadsheet of “Yunshui Wastewater Treatment Plant Project in Guangdong Province” – related to 1 st monitoring period	- Draft Version No. 01, dated 02-July-2022 - Version No. 02, dated 31-August-2022 - Final Version No. 03, dated 18-February-2023	PP
3.	PP	UCWT calculation sheet	- Draft Version No. 01, dated 18-January-2022 - Final Version No. 02, dated 31-August-2022	PP
4.	Local Administrative Examination and Approval Bureau	Business License of PP	Business License of Yunshui Guangdong Environmental Protection Co., Ltd. and Profit Carbon Environmental Energy Technology (Shanghai) Co., Ltd.	PP
5.	Architectural Design and Research Institute of Guangdong Province	Feasibility Study Report	Issued on 15-February-2019	PP
6.	Nanjing Xiangtiange Environmental Protection Technology Co., Ltd.	Environment Impact Assessment (EIA)	Issued in 28-March-2019	PP
7.	Guangdong Provincial Department of Ecology and Environment	EIA approval	Issued on 18-April-2020	PP

8.	Guangdong Provincial Development and Reform Commission	Approval of the project	Issued on 25-February-2019	PP
9.	PP and manufacturers	Equipment purchase contracts	Equipment purchase contracts of all the involved main equipment including coarse screen, Fine screen, Horizontal-flow Grit Chamber, Anaerobic tank, MBR tank, sludge suction machine etc.	PP
10.	PP and China Railway First Group Co., Ltd.	General design and construction contract	Signed on 08-July-2019	PP
11.	Manufacturers	Technical agreement	Technical agreement of main equipment	PP
12.	PP	Statement	Statement of time for all the treatment plants started construction and operation issued on 15-October-2020	PP
13.	Department of Ecological Environment of Guangdong Province	Baseline survey report	Issued on 25-January-2019	PP
14.	Guangdong Housing and Urban-Rural Development Bureau	Sludge Disposal Letter	Issued on 01-August-2020	PP
15.	PP and Guangdong Provincial Development and Reform Commission	Wastewater service treatment agreement	Issued on 26-June-2019	
16.	PP	Operation log of the project	Operation log of the 16 treatment plants	PP
17.	PP	Technical flow charts	Technical flow charts in the project site of 16 treatment plants	PP
18.	South China National Centre of Metrology	Calibration Reports	- Calibration Reports to all the electricity meters with validity covering this monitoring period	PP
			- Calibration Reports to all the electromagnetic weighbridge with validity covering this monitoring period	

			- Calibration Reports to all the electromagnetic flowmeter converter with validity covering this monitoring period - Calibration Reports to all the COD_{cr} water quality online automatic monitor with validity covering this monitoring period	
19.	China National Accreditation Service for Conformity Assessment (CNAS)	Certificate of Metrological Authorization	Certificate of Metrological Authorization of South China National Centre of Metrology issued on 06-November-2019 valid to 21-October-2023	PP
20.	PP	Flow rate operation statistics of wastewater	Flow rate operation statistics of wastewater covering this monitoring period	PP
21.	PP	COD operation statistics of wastewater	COD operation statistics of wastewater covering this monitoring period	PP
22.	PP	Sludge statistics of wastewater	Sludge statistics of wastewater covering this monitoring period	PP
23.	PP	Fuel consumption record book of sludge transport vehicle	Fuel consumption record book of sludge transport vehicle covering this monitoring period	PP
24.	PP and Guangdong Power Grid Corporation	Power purchase agreement	Issued on 05-April-2020	PP
25.	PP	Meter Reading Record	Daily meter reading record of electricity consumed issued by PP for this monitoring period	PP
26.	Guangdong Power Grid Corporation	Monthly electricity bills	Monthly electricity bills issued by grid company for this monitoring period	PP
27.	PP	Local Stakeholder Consultation Records prior to the construction start date	Local stakeholder consultation process evidences: - 30 filled questionnaires by attendance in the Meeting - Meeting records	PP
28.	PP	Local Stakeholder Consultation Records during 1 st monitoring period	Local stakeholder consultation process evidences: 320 filled questionnaires by attendance in the Meeting	PP
29.	PP	Declaration of no double counting and not involved in other GHG scheme	Issued on 05-February-2020	PP

30.	PP and employees	Labor contracts	Labor contracts signed with employees for implementation of this project	PP
31.	PP	Payrolls	Monthly salary slips for employees	PP
32.	PP	Technical Training Records	Technical Training Records of project 1. Training Records in this monitoring period 2. Training register list	PP
33.	National Standard	CJJ/T54-93	Stabilization Lagoons Design Specification	Public Website
34.	National Standard	JJG 596-2012	Electrical Meters for Measuring Alternating-current Electrical Energy	Public website
35.	National Standard	HJ 2024-2012	Technical Specifications for completely mixed anaerobic reaction tank in Wastewater Treatment	Public website
36.	National Standard	JJG1033-2007	Verification Regulation of electromagnetic flowmeter converter	Public Website
37.	National Standard	JJG1012-2019	Verification Regulation of COD _{cr} water quality online automatic monitor	Public Website
38.	National Standard	JJG 539-2016	Verification Regulation of weighbridge	Public Website
39.	National Development and Reform Commission	Guidelines for Accounting Methods and Reporting	Guidelines for Accounting Methods and Reporting of Greenhouse Gas Emissions of Transportation Enterprises	Public Website
40.	IPCC	IPCC	2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, 2006 IPCC Guidelines for National Greenhouse Gas Inventories	Public Website
41.	IPCC	IPCC Fifth Assessment Report	IPCC Fifth Assessment Report	Public Website
42.	UNFCCC	CDM Approved Methodology AM0080	"Mitigation of greenhouse gases emissions with treatment of wastewater in aerobic wastewater" (Version 01)	UNFCCC website
43.	UNFCCC	Methodological tool	Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0)	UNFCCC website
44.	UNFCCC	Methodological tool	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 3.0)	UNFCCC website

45.	UNFCCC	Methodological tool	Tool to calculate the emission factor for an electricity system (Version 07.0)	UNFCCC website
46.	UNFCCC	Methodological tool	Common practice (Version 03.1)	UNFCCC website
47.	VERRA	Template	VCS-Joint-Project-Description-Monitoring-Report-Template-v4.1	VCS website
48.	VERRA	Registration and Issuance Process	Registration and Issuance Process version 4.2	VCS website
49.	VERRA	VCS Program Definitions	VCS Program Definitions, v4.2	VCS website
50.	VERRA	VCS Program Guide	VCS Program Guide, v4.2	VCS website
51.	VERRA	VCS Standard	VCS Standard Version 4.3	VCS website
52.	UNFCCC	CDM Standard	Applicability of sectoral scopes version 01.0	Public Website
53.	China CER platform	CCER	http://cdm.ccchina.org.cn/ccer.aspx	Public Website
54.	UNFCCC	UNFCCC website	https://cdm.unfccc.int	UNFCCC website
55.	VERRA	VCS	https://verra.org/project/vcs-program/	VCS website
56.	GS	GS	http://globalgoals.goldstandard.org/	GS website
57.	Ministry of Ecology and Environment of the People's Republic of China	Guideline	Guideline on Project Construction and Investment for Rural Sewage Treatment http://gdee.gd.gov.cn/attachme nt/0/448/448274/3503534.pdf	Public Website
58.	Ministry of Ecology and Environment of China	China cap & trade scheme	http://www.mee.gov.cn/xxgk2018/xxgk/xxgk02/202101/t20210105_816131.html	Public Website
59.	Ministry of Ecology and Environment of China	Enforced company list	http://mee.gov.cn/xxgk2018/xxgk/xxgk03/202012/W020201230736907682380.pdf	Public Website
60.	Ministry of Ecology and Environment of the People's Republic of China	Baseline emission factor of China	2019 China regional power grid carbon dioxide baseline emission factor OM calculation instructions http://www.mee.gov.cn/ywgz/yd qhbh/wsqt kz/202012/t20201229_815386.shtml	Public Website
61.	Ministry of Ecology and Environment of the People's Republic of China	Technical Specifications	Technical Specifications for Sludge Treatment of Municipal Wastewater Treatment Plant http://www.mee.gov.cn/gkml/hb b/bgth/201004/W020100401574292358556.pdf	Public Website

62.	China Municipal Engineering	Research	Research and application status of residual sludge impurity separation equipment in sewage treatment plant http://qikan.cqvip.com/Qikan/Article/Detail?id=7105351862	Public Website
63.	Ministry of Ecology and Environment of the People's Republic of China	Technical specifications	Technical specifications for Anaerobic-Anoxic-Oxic activated sludge process	Public Website
64.	Ministry of Ecology and Environment of the People's Republic of China	Guideline	Guideline on Best Available Technologies of Pollution Prevention and Control for Township-villages https://www.mee.gov.cn/gkml/hbb/bgg/201307/W020130726461701943622.pdf	Public Website
65.	Ministry of agriculture and rural affairs of the people's Republic of China	Guiding opinions	Guiding opinions on promoting rural domestic sewage treatment http://www.moa.gov.cn/nybg/2019/201907/202001/t20200103_6334298.htm	Public Website
66.	Research	Sludge treatment industry in China	http://pdf.dfcfw.com/pdf/H3_AP202008131398231167_1.pdf	Public Website
67.	Public Website	Price index of investment in fixed asset	http://www.stats.gov.cn/	Public Website
68.	Public Website	Development and Reform Commission of Guangdong Province	http://drc.gd.gov.cn/	Public Website
69.	Public Website	Guangdong Provincial Statistics Bureau website	http://stats.gd.gov.cn/	Public Website
70.	VVB	Site Visit Photo	Photo taken by VVB during site visit including main equipment, monitoring devices, etc.	N/A
71.	National Government	Law&Regulation	“Environmental Protection Law of P.R. China”, “Law of the People's Republic of China on the Environmental Impact Assessment” “Law of the P. R. China on the Prevention and Control of Environmental Pollution by Solid Waste” “Water Pollution Prevention and Control Law of the People's Republic of China”	Public Website

			“Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution” “Law of the People's Republic of China on Prevention and Control of Pollution from Environmental Noise”	
72.	Public Website	Meteorological Bureau website	https://m.tianqi.com/qiwen/city/	Public Website
73.	Project owner and the landfills	Sludge Landfill Contracts	Sludge Landfill Contracts signed in August 2020	PP
74.	National Standard	GB18918-2002	Emission Standard for Pollutants from Municipal Wastewater Treatment Plants	Public Website
75.	Guangdong local standard	DB44/26-2001	Water pollutants emission limits	Public Website
76.	Ministry of Ecological Environment	Guideline on Project Construction and Investment for Rural Sewage Treatment	https://www.ceett.org.cn/huanbao/static/file/upload/20200415173752607.pdf	Public Website
77.	Public Website	Department of Ecology and Environment of Guangdong Province	http://gdee.gd.gov.cn/	Public Website
78.	Public Website	Public statistics of temperature	https://www.tianqi24.com/city/history.html	Public Website
79.	Meteorological bureau of each town	Monthly average temperature monitoring report	Monthly average temperature monitoring report of the 16 plants during this monitoring period	PP
80.	Ministry of Housing and Urban-Rural Development	Technical Construction Plan for Wastewater Treatment Plant	http://down.foodmate.net/standard/yulan.php?itemid=45559	Public Website

APPENDIX 4: CLARIFICATION REQUESTS, CORRECTIVE ACTION REQUESTS AND FORWARD ACTION REQUESTS

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

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

Table 2.CL from this verification

CL ID	01	Section no.	1.13	Date : 29/07/2022
Description of CL				
The scenario prior to project initiation is not clarified actually and clearly.				
Project participant response				Date : 24/08/2022
Before the implementation of the project, the rural residents' domestic wastewater in the project site is treated by the existing local open anaerobic lagoons, so the pre-project scenario is the baseline scenario. Please refer to the section 1.13 of revised Joint-PD-MR for more details.				
Documentation provided by project participant				
/1/- version 2.0 /13/				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the clarification has been added. Via checking the Joint-PD-MR/1/, it is confirmed that the scenario existing prior to the implementation of the project is the rural residents' domestic wastewater in the project site is treated by the existing local open anaerobic lagoons and methane is emitted to the atmosphere directly without any methane recovery and destruction facility. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity, which has been confirmed during the site interview with PP and on-site checking the baseline survey report/13/. Thus it is verified that the scenario existing prior to the implementation of the project is reasonable and correct. CL 01 is closed.				

CL ID	02	Section no.	1.16.1	Date : 29/07/2022
Description of CL				
PP is not to clarify that how to avoid double counting of the project by considering China has a national emissions trading scheme.				
Project participant response				Date : 24/08/2022
The project owner has signed the Declaration of No Double Counting Statement and Declaration of not involved in other GHG scheme on 05-February-2020. And then there is a cap & trade scheme in China. However, the project activity is not included in the mandatory emission control scheme since the scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO ₂ e/year. So there is no emission cap enforced for the project owner. The project				

proponent is not part of any emission trading program. The net GHG emission reductions from the project will not be used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs. Please refer to the section 1.13 of revised Joint-PD-MR for more details.

Documentation provided by project participant

/1/- version 2.0

/29/

VVB assessment

Date: 30/08/2022

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

The project proponent is not part of any emission trading program which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website. The net GHG emission reductions during this monitoring period from the project was not used for compliance with emission trading programs or to meet binding limits on GHG emissions. The project activity has not participated under any other GHG programs which has been confirmed via checking the UNFCCC/54/, GS/56/, VCS/55/ and other GHG schemes' website, it is verified that the implementation of the project is consistent with the description in the Joint-PD-MR and the monitoring system is fully functional to generate Verified Carbon Units (VCUs) without any double counting for this monitoring period from 03-September-2020 to 30-June-2022.

Besides, based on VVB's local expertise, China has a national emissions trading scheme only cover the high-emission industries, such as power generation sector that emitted at least 26,000 tons of CO₂e/year which has been verified in the public website/58/, and it is confirmed that the project activity is not included the mandatory emission control scheme and there is no emission cap enforced for the project owner by checking the enforced company list in public information/59/.

Besides, the "Declaration of No Double Counting and not involved in other GHG scheme"/29/ have been checked, CTI verified that PP promised not to double counting the project in any other scheme.

Hence, it is confirmed that the emission reductions will not be double counted.

CL 02 is closed.

CL ID	03	Section no.	2.2	Date : 29/07/2022
Description of CL				
In section 2.2,				
1. The information of local stakeholder consultation is not provided as per the requirement of the JPM template.				
2. The category of the participants attended the stakeholder consultation meeting is not clarified.				
3. The questions and answers of the stakeholder consultation meeting are not clarified.				
4. The actual local stakeholder consultation process for this monitoring period is not clarified.				
Project participant response				Date : 24/08/2022
1. The missing information of local stakeholder consultation has been supplemented as per the requirement of the JPM template (Version 4.1), please refer to the revised Joint-PD-MR (Version 02) for more details.				
2. The category of the participants attended the stakeholder consultation meeting has been supplemented. Please refer to section 2.2 of revised JPM (Version 02) for more details.				
3. The questions and answers of the stakeholder consultation meeting has been supplemented. Please refer to section 2.2 of revised Joint-PD-MR (Version 02) for more details.				
4. The actual local stakeholder consultation process for this monitoring period has been supplemented. Please refer to section 2.2 of revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
/27/				
/28/				
VVB assessment				Date: 30/08/2022
1. The revised Joint-PD-MR is checked, CTI confirmed that information of local stakeholder consultation is provided as per the requirement of the JPM template.				

2. The revised Joint-PD-MR is checked, CTI confirmed that category of the participants attended the stakeholder consultation meeting has been clarified which is confirmed as correct by checking the filled questionnaires/27/.
 3. The revised Joint-PD-MR is checked, CTI confirmed that the questions and answers of the stakeholder consultation meeting has been clarified which is confirmed as correct by checking the filled questionnaires/27/.
 4. The revised Joint-PD-MR is checked, CTI confirmed that the actual local stakeholder consultation process for this monitoring period has been clarified which is confirmed as correct by checking the filled questionnaires/28/.
- Refer to section 3.3.2 of this report for detail assessment.
CL 03 is closed.

CL ID	04	Section no.	2.3	Date : 29/07/2022
Description of CL				
The demonstration of environmental impact from the project is not in line with the EIA which analyzed all the potential impacts for both construction and operation period.				
Project participant response				Date : 24/08/2022
The environmental impact of the project has been supplemented in detail according to EIA, mainly analyzing the potential impact and mitigation measures of the project during the construction period and the operation period. Please refer to section 2.3 of revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0 /6/				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that environmental impacts which analyzed for both construction and operation period is added which is verified as correct and actual by checking the EIA/6/.				
CL 04 is closed.				

CL ID	05	Section no.	3.3	Date : 29/07/2022
Description of CL				
In table 3-3, the emission sources are not correctly identified based on the actual situation of baseline and project scenario.				
Project participant response				Date : 24/08/2022
For the project, the emission from power generation / thermal energy in the baseline scenario does not exist, so it can be excluded. It has been revised accordingly.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the Emissions sources included in the project boundary have been appropriately included in the updated Joint-PD-MR. CH ₄ due to emissions from the wastewater treatment and CO ₂ emissions from transportation of sludge are covered for baseline scenario and the project scenario has emissions due to CO ₂ emissions from on-site electricity use, CO ₂ emissions from transportation of sludge and CH ₄ emissions from the wastewater treatment processes.				
CL 05 is closed.				

CL ID	06	Section no.	3.5	Date : 29/07/2022
Description of CL				
For step 1b in additionality demonstration, how the alternatives 1 and 2 in line with the mandatory laws and regulations is not clarified.				
Project participant response				Date : 24/08/2022

As per “Technical specifications for Anaerobic-Anoxic-Oxic activated sludge process” issued by Ministry of Ecology and Environment of the People’s Republic of China, So aerobic sewage treatment technology is a typical sewage treatment method at present, which conforms to Chinese laws and regulations and can effectively prevent and control sewage pollution.

According to “Guideline on Best Available Technologies of Pollution Prevention and Control for Township-villages” issued by Ministry of environmental protection of the people's Republic of China, the open anaerobic lagoon is a kind of wastewater treatment method recognized by the state, which need minimum financial cost and is compliance with laws and regulations. Therefore, it is the most economic, viable and reasonable for project owners. As per “Guiding opinions on promoting rural domestic sewage treatment” issued by Ministry of agriculture and rural affairs of the people's Republic of China, the state actively promotes low-cost, low energy consumption, easy maintenance and high-efficiency sewage treatment technologies, oxidation lagoons (including anaerobic lagoons) and other ecological treatment modes.

And then as per overview of sludge treatment industry in China, at present, the treatment of sludge is still mainly landfill.

Therefore, the Scenario W2-S2: “Aerobic wastewater treatment facilities with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery” and Scenario W3-S2: Existing anaerobic open lagoons system without methane recovery and flaring with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery” are all consistency with mandatory laws and regulations. So, the outcome of Step 1b is unchanged from Step 1a.

The detailed description has been added to section 3.5 of the revised Joint-PD-MR (Version 02).

Documentation provided by project participant

/1/- version 2.0

/64/

/63/

/65/

/66/

VVB assessment

Date: 30/08/2022

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

Via searching the public website with laws and regulations in Guangdong Province and China by CTI, especially “Technical specifications for Anaerobic-Anoxic-Oxic activated sludge process”/63/ issued by Ministry of Ecology and Environment of the People’s Republic of China, CTI confirmed that aerobic sewage treatment technology is a typical sewage treatment method at present, which conforms to Chinese laws and regulations and can effectively prevent and control sewage pollution. And via checking the “Guideline on Best Available Technologies of Pollution Prevention and Control for Township-villages”/64/ and “Guiding opinions on promoting rural domestic sewage treatment”/65/, CTI confirmed that the open anaerobic lagoon is a kind of wastewater treatment method recognized by the state in China, which need minimum financial cost and is compliance with laws and regulations and the state actively promotes low-cost, low energy consumption, easy maintenance and high-efficiency sewage treatment technologies, oxidation lagoons (including anaerobic lagoons) and other ecological treatment modes.

Besides, the overview of sludge treatment industry in China/66/ has been checked and CTI confirmed that the treatment of sludge is still mainly landfill.

As assessed above, CTI confirmed that the above options of Scenario W2-S2 and Scenario W3-S2 are considered to follow all mandatory applicable legal and regulatory requirements which are verified based in validation team’s local expertise.

CL 06 is closed.

CL ID	07	Section no.	4.1	Date : 29/07/2022
Description of CL				
For the formular (3), PP is not clarified why this formular is chosen as per the applied methodology.				
Project participant response				Date : 24/08/2022

According to page 10 of methodology, if there would be an effluent from the lagoons in the baseline, $COD_{BL,ww,y}$ should be adjusted by an effluent adjustment factor which relates the COD supplied to the lagoon with the COD in the effluent. In this project, the baseline scenario is that wastewater continues to be treated by existing anaerobic lagoons instead of the newly-build anaerobic lagoons, so the calculation formula of $COD_{BL,ww,y}$ should be the formula (4) of page 10 in methodology.

The detailed description has been added to section 4.1 of the revised Joint-PD-MR (Version 02).

Documentation provided by project participant

/1/- version 2.0

VVB assessment

Date: 30/08/2022

The revised Joint-PD-MR is checked, CTI confirmed that the reason has been added which is in line with the request of applied methodology

Refer to section 3.4.6 of this report for detail assessment.

CL 07 is closed.

CL ID	08	Section no.	4.1	Date : 29/07/2022
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Description of CL

For the formular (5), PP is not clarified why this formular is chosen as per the applied methodology and identified baseline scenario.

Project participant response

Date : 24/08/2022

In this project, the baseline scenario is that wastewater continues to be treated by existing anaerobic lagoons. Before the construction of the project, in order to investigate the influent COD and flow, effluent COD and flow, quantity of sludge transportation, the local government conducted a complete monitoring process on the influent COD and flow, effluent COD and flow, quantity of sludge transportation of the anaerobic lagoons in 2018 (From 01-January-2018 to 31-December-2018). Please see the feasibility study report for more details. Therefore, according to page 9 of methodology, ADBL should be calculated according to the Option A of page 9 in the methodology.

The detailed description has been added to section 4.1 of the revised JPM (Version 02).

Documentation provided by project participant

/1/- version 2.0

VVB assessment

Date: 30/08/2022

The revised Joint-PD-MR is checked, CTI confirmed that the reason has been added which is in line with the request of applied methodology and based on the identified baseline scenario.

Refer to section 3.4.6 of this report for detail assessment.

CL 08 is closed.

CL ID	09	Section no.	4.1	Date : 29/07/2022
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Description of CL

For the formular (6), (7), (9), PP is not clarified why these formulars is chosen as per the applied methodology and actual situation of the project.

Project participant response

Date : 24/08/2022

For the purpose of ex ante estimations, IPCC default values of methane conversion factors ($MCF_{BL,ww,y}$) for different treatment types and conditions should be used as per IPCC Guidelines. As per baseline survey report, the depth of the local anaerobic lagoons system of the project is more than 5 m, and then as per table 6.8 of chapter 6 in 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, when the depth of anaerobic system is greater than 5m, the default value of MCF is 0.8. Referring to the local historical average temperature of the project, the calculation results of $MCF_{BL,ww,y}$ are all lower than 0.8 (See the calculation results shown in the Joint-PD-MR). Therefore, if the calculation value is used, the results will be more conservative. Therefore, $MCF_{BL,ww,y}$ will use the calculated value instead of the default value of IPCC.

So formular (6) is chosen as per the applied methodology and actual situation of the project.

Since formula (6) is selected, formula (7) also needs to be calculated according to methodology.

Similarly, since formula (6) is selected, formula (8) also needs to be calculated according to methodology.

The detailed description has been added to section 4.1 of the revised Joint-PD-MR (Version 02).	
Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the reason has been added which is in line with the request of applied methodology and based on the actual situation of the project. Refer to section 3.4.6 of this report for detail assessment. CL 09 is closed.	

CL ID	10	Section no.	4.2	Date : 29/07/2022
Description of CL				
For the formular (14), PP is not clarified why this formular is chosen as per the applied methodology and actual situation of the project.				
Project participant response				Date : 24/08/2022
Due to the highly site specific nature of the factors leading to the development of anaerobic conditions in aerobic wastewater treatment plants, it is difficult to provide a clear-cut procedure and monitoring parameters to determine CH ₄ emissions for plants under inadequate operational conditions. This methodology applies a proxy parameter, the oxidation ratio (OR) described in JPM. In order to conservatively account for emissions, the higher value (MCF=0.4) of the IPCC MCF range for aerobic treatment plant should be used if the oxidation ratio (OR) is out of an acceptable range. If the oxidation ratio is within the acceptable range, emissions should be considered zero. The detailed description has been added to section 4.2 of the revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the reason has been added which is in line with the request of applied methodology and based on the actual situation of the project. Refer to section 3.4.6 of this report for detail assessment. CL 10 is closed.				

Table 3.CAR from this verification

CAR ID	01	Section no.	1.1	Date : 29/07/2022
Description of CAR				
1. PP is requested to update the baseline scenario description to be accurate. 2. PP is requested to provide the consistent description of the component of the wastewater.				
Project participant response				Date : 24/08/2022
1. In the baseline scenario without project activities, residents' domestic wastewater was treated through a series of deep open anaerobic lagoons. The open lagoons are the best available low-cost operation solution for wastewater treatment, which is also in compliance with local environmental regulations. The detailed description has been added to section 1.1 of the revised JPM (Version 02). 2. The wastewater is composed of residents' domestic wastewater within the service area. The correct description has been added to the whole revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0 /5/				
VVB assessment				Date: 30/08/2022
1. The revised Joint-PD-MR is checked, CTI confirmed that the baseline scenario description has been updated as accurate and actual. 2. The revised Joint-PD-MR is checked, CTI confirmed that the component of the wastewater has been updated in the whole file as consistent and in line with the actual situation.				

Refer to section 3.1 of this report for detail assessment.
CAR 01 is closed.

CAR ID	02	Section no.	1.3	Date : 29/07/2022
Description of CAR				
The VCS Standard version used in Joint-PD-MR should be updated to the latest version.				
Project participant response				Date : 24/08/2022
The VCS Standard version used in Joint-PD-MR has been updated to the latest version. Please refer to the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the VCS Standard has been updated to version 4.3 in the whole Joint-PD-MR which has been verified in line with the VCS Standard Version 4.3/51/. CAR 02 is closed.				

CAR ID	03	Section no.	1.12	Date : 29/07/2022
Description of CAR				
PP is requested to provide map which can show detail location of each wastewater treatment plant.				
Project participant response				Date : 24/08/2022
The maps which show detail location of each wastewater treatment plant has been added to section 4.2 in Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that a separate map which can show detail location of each wastewater treatment plant has been supplemented, which is verified as correct by site inspection with GPS device. CAR 03 is closed.				

CAR ID	04	Section no.	1.17	Date : 29/07/2022
Description of CAR				
As per the JPM template, evidence of the project's SD contributions shall be provided as appendices to this report, however, the evidence of the project's SD contributions is missing in Appendices of JPM.				
Project participant response				Date : 24/08/2022
Evidence of the project's SD contributions has been provided as appendices to this report, please refer to the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the related evidence has been added into Appendix 1 of the JPM which is consistent with the evidence shown to VVB during site visit. Refer to section 3.1 of this report for detail assessment. CAR 04 is closed.				

CAR ID	05	Section no.	2.4	Date : 29/07/2022
Description of CAR				
The actual information of public comments from VCS GSC is not specified.				
Project participant response				Date : 24/08/2022
This project was open for public comment from 05-April-2022 to 05-May-2022. No comments were received for the Project. please refer to section 2.4 in the revised Joint-PD-MR (Version 02) for more details.				

Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. The project sought the registration with the VCS Program, according to VCS requirements the Project Description was submitted for public comment period. The project was allocated with VCS ID 2938. The public comment period started on 05-April-2022 and ended on 05-May-2022 (https://registry.terra.org/app/projectDetail/VCS/2938). No comments were received during this period which has been verified by checking the dedicated website as above. CAR 05 is closed.	

CAR ID	06	Section no.	3.2	Date : 29/07/2022
Description of CAR				
For the applicability 1 to the methodology, the justification provided by PP is not in line with the applicability condition.				
Project participant response				Date : 24/08/2022
Yunshui Wastewater Treatment Plant Project in Guangdong province (hereafter referred to as the project) introduces 16 aerobic wastewater treatment plant to treat rural residents' domestic wastewater in 16 regions of Guangdong Province. The sludge generated from the aerobic wastewater treatment plants in the project activity is dried under controlled and aerobic conditions and subsequently sent to a landfill for disposal. According to Sludge Disposal Letter issued by Guangdong Housing and Urban-Rural Development Bureau, and the sludge will be transported to the local 16 landfills, which has a methane recovery device. In addition, according to the baseline survey report of the project site, the sludge produced by the local anaerobic lagoons is also treated under controlled and aerobic conditions, and then transported to the landfill with methane recovery for landfill. So the sludge produced by the aerobic wastewater treatment plant in the project activities is treated in the same way as the sludge produced by the anaerobic open lagoon system. The treatment method is drying under controlled and aerobic conditions, and then transported to the landfill with methane recovery for landfill. The treatment scenario belongs to (1) (ii) Therefore, this condition is applicable. Please refer to section 3.2 in the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the justification has been updated accordingly. Refer to section 3.4.2 of this report for detail assessment. CAR 06 is closed.				

CAR ID	07	Section no.	3.2	Date : 29/07/2022
Description of CAR				
1. For the applicability 1 to the methodology, the demonstration of the project to applicable to criteria 3 is not correct and in line with the request from the methodology. 2. For the applicability 3 and 4 to the methodology, the description of the baseline is not consistent.				
Project participant response				Date : 24/08/2022
1. Relevant contents have been corrected. Please refer to Section 3.2 of the revised Joint-PD-MR (Version 02) for more details. 2. For the applicability 3 and 4 to the methodology, the description of the baseline has been changed. Please refer to Section 3.2 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022

1. The revised Joint-PD-MR is checked, CTI confirmed that the demonstration has been updated accordingly.
 2. The revised Joint-PD-MR is checked, CTI confirmed that description has been consistent and actual. Refer to section 3.4.2 of this report for detail assessment.
- CAR 07 is closed.

CAR ID	08	Section no.	3.3	Date : 29/07/2022
Description of CAR				
For definition and the provided diagram of the project boundary is not defined as per the applied methodology and actual situation of the project.				
Project participant response				Date : 24/08/2022
Relevant contents have been corrected as per the applied methodology and actual situation of the project. Please refer to Section 3.3 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0 /9/				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the project boundary information and corresponding diagram has been updated accordingly. Refer to section 3.4.3 of this report for detail assessment. CAR 08 is closed.				

CAR ID	09	Section no.	3.4	Date : 29/07/2022
Description of CAR				
The step 0 of the Tool 02 Combined tool to identify the baseline scenario and demonstrate additionality (Version 07.0) is not demonstrated of this project.				
Project participant response				Date : 24/08/2022
Step 0: As per Tool 02 “Combined tool to identify the baseline scenario and demonstrate additionality” (Version 07.0), this step is optional. So, it is not necessary to analyse this step. It has been added to Section 3.4 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that demonstration of the step 0 has been added accordingly which is confirmed in line with the requirement of the tool. CAR 09 is closed.				

CAR ID	10	Section no.	3.4	Date : 29/07/2022
Description of CAR				
1. The identification of the alternative scenarios of wastewater (W) is not correctly described as per the actual situation of the project design. 2. The final identification of the alternatives 1 and 2 are not correctly listed.				
Project participant response				Date : 24/08/2022
1. The relevant contents have been corrected, and the alternative scenarios are as follows: W2: Aerobic wastewater treatment facilities; W3: Existing anaerobic open lagoons system without methane recovery and flaring Please refer to Section 3.4 of the revised Joint-PD-MR (Version 02) for more details. 2. The final identification of the alternatives 1 and 2 are: W2-S2: Aerobic wastewater treatment facilities (e.g. activated sludge or filter bed type treatment) with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery. This scenario is same to the project but is not a VCS project activity. W3-S2: Existing anaerobic open lagoons system without methane recovery and flaring with sludge being dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery				

or with use in soil application. This scenario continue adopts best available and commonly used low-cost solution for wastewater treatment.

Please refer to Section 3.4 of the revised Joint-PD-MR (Version 02) for more details.

Documentation provided by project participant

/1/- version 2.0

VVB assessment

Date: 30/08/2022

1. The revised Joint-PD-MR is checked, CTI confirmed that identification of the alternative scenarios of wastewater (W) have been updated to be in line with the actual situation of the project design.
2. The revised Joint-PD-MR is checked, CTI confirmed that the final identification of the alternatives 1 and 2 are correctly listed.

Refer to section 3.4.4 of this report for detail assessment.

CAR 10 is closed.

CAR ID	11	Section no.	3.5	Date : 29/07/2022
Description of CAR				
The investment analysis is not correctly demonstrated based on the actual project design comparing with the baseline scenario.				
Project participant response				Date : 24/08/2022
The investment analysis has been correctly demonstrated, please refer to Section 3.5 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that demonstration of investment analysis has been updated accordingly.				
Refer to section 3.4.5 of this report for detail assessment.				
CAR 11 is closed.				

CAR ID	12	Section no.	3.5	Date : 29/07/2022
Description of CAR				
For common practice justification,				
1. Methodological tool: "common practice (version 03.1)" is not correctly listed. 2. The title for Sub-step 4a is not applicable. 3. Data source for identify the similar projects are not provided.				
Project participant response				Date : 24/08/2022
1. The correct list of this tool should be: Tool 24 common practice (version 03.1). It has been corrected, please refer to Section 3.5 of the revised Joint-PD-MR (Version 02) for more details. 2. According to the Tool 24"Common practice (version03.1), the measure of the project belongs to "Methane formation avoidance". Thus, sub-steps are adopted to take the common practice analysis. the relevant description has been revised, please refer to Section 3.5 of the revised Joint-PD-MR (Version 02) for more details. 3. Data source has been added, please refer to Section 3.5 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022

1. The revised Joint-PD-MR is checked, CTI confirmed that the “common practice (version 03.1)” has been used for demonstrate the common practice.
2. The revised Joint-PD-MR is checked, CTI confirmed that titles have been updated accordingly as per the tool.
3. The revised Joint-PD-MR is checked, CTI confirmed that data source for identify the similar projects are provided accordingly.
Refer to section 3.4.5 of this report for detail assessment.
CAR 12 is closed.

CAR ID	13	Section no.	4.1	Date : 29/07/2022
Description of CAR				
In section 4.1, how the ex-ante value of $BE_{CH4,ww,y}$ is calculated is not clear, the ex ante determined values for all the used parameters are not provided.				
Project participant response				Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.1 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0 /5/				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 13 is closed.				

CAR ID	14	Section no.	4.1	Date : 29/07/2022
Description of CAR				
In section 4.1, how the ex-ante value of $BE_{TR,SL,y}$ is calculated is not clear, the ex ante determined values for all the used parameters are not provided.				
Project participant response				Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.1 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0 /5/				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 14 is closed.				

CAR ID	15	Section no.	4.2	Date : 29/07/2022
Description of CAR				
In section 4.2, how the ex-ante value of OR_i is calculated is not provided.				
Project participant response				Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.1 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 15 is closed.				

CAR ID	16	Section no.	4.2	Date : 29/07/2022
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Description of CAR	
In section 4.2, how the ex-ante value of $PE_{CH4,effl,y}$ is calculated is not clear, the ex ante determined values for all the used parameters are not provided.	
Project participant response	Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.1 of the revised Joint-PD-MR (Version 02) for more details.	
Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 16 is closed.	

CAR ID	17	Section no.	4.2	Date : 29/07/2022
Description of CAR				
In section 4.2, how the value of $EF_{EL,j,y}$ is calculated as per the stepwise in Tool to calculate the emission factor for an electricity system" (Version 07.0) is not provided.				
Project participant response				Date : 24/08/2022
The stepwise process of calculating $EF_{EL,j,y}$ has been listed in detail according to the "Tool to calculate the emission factor for an electricity system" (Version 07.0). Please refer to Section 4.2 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added, the e stepwise process of calculating $EF_{EL,j,y}$ have been verified as in line with the "Tool to calculate the emission factor for an electricity system" (Version 07.0)/45/. CAR 17 is closed.				

CAR ID	18	Section no.	4.2	Date : 29/07/2022
Description of CAR				
In section 4.2, how the ex-ante value of $PE_{EC,y}$ is calculated is not clear, the ex ante determined values for all the used parameters are not provided.				
Project participant response				Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.2 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 18 is closed.				

CAR ID	19	Section no.	4.2	Date : 29/07/2022
Description of CAR				
In section 4.2, how the ex-ante value of $PE_{TR,sl,y}$ is calculated is not clear, the ex ante determined values for all the used parameters are not provided.				
Project participant response				Date : 24/08/2022
All the ex ante determined values for all the used parameters has been provided, please refer to Section 4.2 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				

VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been added. Refer to section 3.4.6 of this report for detail assessment of each parameter. CAR 19 is closed.	

CAR ID	20	Section no.	5.1	Date : 29/07/2022
Description of CAR				
For parameter $COD_{BL,in,x}$ and $COD_{BL,out,x}$, the source of data is not consistent with the requirement of applied methodology.				
Project participant response				Date : 24/08/2022
The baseline scenario is that wastewater continues to be treated by existing anaerobic lagoons. As per the methodology, Before the construction of the project, in order to investigate the influent COD and flow, effluent COD and flow, quantity of sludge transportation, the local government conducted a complete monitoring process on the influent COD and flow, effluent COD and flow, quantity of sludge transportation of the anaerobic lagoons in 2018(From 01-January-2018 to 31-December-2018). The data is from the feasibility study report.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the source of data has been updated to be correct and accurate. Refer to section 3.4.8 of this report for detail assessment. CAR 20 is closed.				

CAR ID	21	Section no.	5.1	Date : 29/07/2022
Description of CAR				
For parameter $Q_{BL,sl,y}$, the source of data is not consistent with the requirement of applied methodology.				
Project participant response				Date : 24/08/2022
The baseline scenario is that wastewater continues to be treated by existing anaerobic lagoons. As per the methodology, Before the construction of the project, in order to investigate the influent COD and flow, effluent COD and flow, quantity of sludge transportation, the local government conducted a complete monitoring process on the influent COD and flow, effluent COD and flow, quantity of sludge transportation of the anaerobic lagoons in 2018 (From 01-January-2018 to 31-December-2018). The data is from the feasibility study report.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the source of data has been updated to be correct and accurate. Refer to section 3.4.8 of this report for detail assessment. CAR 21 is closed.				

CAR ID	22	Section no.	5.1	Date : 29/07/2022
Description of CAR				
For parameter $F_{BL,i}$, $NCV_{BL,j}$ and $EF_{BL,j}$, $q_{BL,i}$, the source of data is not consistent with the requirement of applied methodology.				
Project participant response				Date : 24/08/2022
As per the requirement of applied methodology, the source of $F_{BL,i}$, $NCV_{BL,j}$ and $EF_{BL,j}$, $q_{BL,i}$ should be historical data available on-site, it has been revised. Please refer to section 5.1 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022

The revised Joint-PD-MR is checked, CTI confirmed that the source of data has been updated to be correct and accurate.
Refer to section 3.4.8 of this report for detail assessment.
CAR 22 is closed.

CAR ID	23	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $Q_{PJ,ww,m}$ and $Q_{PJ,ww,i}$, the information of monitoring charged person, who records and location of the monitoring device is missing.				
Project participant response				Date : 24/08/2022
The monitoring team of the wastewater treatment plants will be responsible for monitoring and recording the data. $Q_{PJ,ww,m}$ and $Q_{PJ,ww,i}$ was monitored by the electromagnetic flowmeter converter. Each of the 16 wastewater treatment plants has an electromagnetic flowmeter converter to monitor the influent flow into the wastewater treatment plant, it was installed in front of pre-treatment process of the wastewater plant. It has been added to the section 5.2 of the revised Joint-PD-MR (Version 02)				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented. Refer to section 3.4.8 of this report for detail assessment. CAR 23 is closed.				

CAR ID	24	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $W_{PJ,COD,ww,m}$ and $W_{PJ,COD,ww,i}$, - The information of actual referred standard and its source, the requirement of the standard for measuring the parameters is missing. - If the average monthly values are used for calculations is not specified as per the methodology. - The calculation method is not correct.				
Project participant response				Date : 24/08/2022
- It has been revised, please refer to section 5.2 of the revised Joint-PD-MR (Version 02). - COD monitoring frequency is once every two hours, the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations. Relevant description has been added to the section 5.2 of the revised Joint-PD-MR (Version 02). - The average monthly values will be used for calculations. It has been corrected. Please refer to section 5.1 of the revised Joint-PD-MR (Version 02) for more details.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
- The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented. - The revised Joint-PD-MR is checked, CTI confirmed that the information has been updated. - The revised Joint-PD-MR is checked, CTI confirmed that calculation method is updated to be correct. Refer to section 3.4.8 of this report for detail assessment. CAR 24 is closed.				

CAR ID	25	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $T_{2,m}$ The source of data is not consistent with the requirement of applied methodology.				

2. The monitoring frequency is not consistent with the requirement of applied methodology.	
Project participant response	Date : 24/08/2022
1. Data of $T_{2,m}$ was from the website at https://m.tianqi.com/qiwen/city/ , the data of this website comes from the China Meteorological Administration, which has conducted on-site measurements, and the data is the historical monthly average. China Meteorological Administration is the authoritative organization in China, so the data is reliable. Relevant description has been added to the section 5.2 of the revised Joint-PD-MR (Version 02).	
2. The monitoring frequency of $T_{2,m}$ should be continuously and aggregated in monthly average values. It has been revised as per requirement of applied methodology	
Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
1. The revised Joint-PD-MR is checked, CTI confirmed that the source of data has been updated in line with the requirement of applied methodology.	
2. The revised Joint-PD-MR is checked, CTI confirmed that the monitoring frequency has been updated in line with the requirement of applied methodology.	
Refer to section 3.4.8 of this report for detail assessment.	
CAR 25 is closed.	

CAR ID	26	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $Q_{PJ,effl,m}$ and $Q_{PJ,effl,i}$, the information of monitoring charged person, who records and location of the monitoring device is missing.				
Project participant response				Date : 24/08/2022
Relevant description has been added to the section 5.2 of the revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented.				
Refer to section 3.4.8 of this report for detail assessment.				
CAR 26 is closed.				

CAR ID	27	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $W_{PJ,COD,effl,m}$ and $W_{PJ,COD,effl,i}$,				
1. The information of actual referred standard and its source, the requirement of the standard for measuring the parameters is missing.				
2. If the average monthly values are used for calculations is not specified as per the methodology.				
3. The calculation method is not correct.				
Project participant response				Date : 24/08/2022
1. It has been revised accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02).				
2. COD monitoring frequency is once every two hours, the average daily COD was calculated based on the 24-hourly data, the average monthly COD was calculated based on all the daily data of this month, the average monthly values will be used for calculations. It has been revised accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02).				
3. It has been revised accordingly.				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022

1. The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented.
2. The revised Joint-PD-MR is checked, CTI confirmed that the information has been updated.
3. The revised Joint-PD-MR is checked, CTI confirmed that calculation method is updated to be correct.

Refer to section 3.4.8 of this report for detail assessment.

CAR 27 is closed.

CAR ID	28	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $f_{PJ,d,y}$,				
1. The information of who records and which file created is missing. 2. The information of monitoring equipment is not correct. 3. The monitoring frequency is not consistent with the requirement of applied methodology. 4. The calibration request of the monitoring device is missing.				
Project participant response				Date : 24/08/2022
1. It has been added accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02). 2. It has been added accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02). 3. It has been revised accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02). 4. It has been added accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
1. The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented. 2. The revised Joint-PD-MR is checked, CTI confirmed that the information of monitoring equipment is updated to be correct. 3. The revised Joint-PD-MR is checked, CTI confirmed that the monitoring frequency has been updated in line with the requirement of applied methodology. 4. The revised Joint-PD-MR is checked, CTI confirmed that the calibration request of the monitoring device has been supplemented.				
Refer to section 3.4.8 of this report for detail assessment.				
CAR 28 is closed.				

CAR ID	29	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $Q_{PJ,sl,y}$, the information of monitoring charged person, who records and location of the monitoring device is missing.				
Project participant response				Date : 24/08/2022
The monitoring team of the wastewater treatment plant will be responsible for monitoring and recording the data.				
Each of the 16 wastewater treatment plants has an weighbridge to monitor sludge generated from the wastewater treatment plants, it was installed after the sludge treatment process of the wastewater plants.				
It has been added accordingly. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the information has been supplemented.				
Refer to section 3.4.8 of this report for detail assessment.				
CAR 29 is closed.				

CAR ID	30	Section no.	5.2	Date : 29/07/2022
Description of CAR				
For parameter $D_{PJ,i,y}$, the source of data is not consistent with the requirement of applied methodology.				

Project participant response	Date : 24/08/2022
It has been revised according to the methodology. Please refer the section 5.2 of the revised Joint-PD-MR (Version 02). The ex-ante data can be available in the feasibility study report. The local government conducted on-site measurements on the distance between the wastewater treatment plants and the landfills, The data can be obtained from the letter on sludge treatment issued by the Guangdong Housing and Urban-Rural Development Bureau, and the data in the feasibility study report also comes from the on-site measurements of the government. Ex-post data will be monitored.	
Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the source of data has been updated to be consistent with the requirement of applied methodology. Refer to section 3.4.8 of this report for detail assessment. CAR 30 is closed.	

CAR ID	31	Section no.	1.11	Date : 29/07/2022
Description of CAR				
1. The actual status of the 16 existing baseline open lagoon and sludge transportation is missing. 2. Baseline scenario is missing. 3. The technical parameters of all the main equipment are missing. 4. The actual status of the project during this monitoring period is missing. 5. The time for project started construction, commissioning and operation is missing for 16 plants.				
Project participant response				Date : 24/08/2022
1. Before the implementation of the project, the wastewater from 16 areas in Guangdong Province was treated by local open anaerobic lagoons, and the methane was directly discharged into the atmosphere. There was no methane recovery and destruction facilities, and the sludge generated by the anaerobic lagoons was dried under controlled and aerobic conditions and its disposal in a landfill with methane recovery. After the implementation of the project, the original open anaerobic lagoons has been removed. 2. It has been added, please refer to section 1.11 of the revised Joint-PD-MR (Version 02). 3. It has been added, please refer to section 1.11 of the revised Joint-PD-MR (Version 02). 4. It has been added, please refer to section 1.11 of the revised Joint-PD-MR (Version 02). 5. It has been added, please refer to section 1.11 of the revised Joint-PD-MR (Version 02).				
Documentation provided by project participant				
/1/- version 2.0				
VVB assessment				Date: 30/08/2022
1. The revised Joint-PD-MR is checked, CTI confirmed that actual status of the 16 existing baseline open lagoon and sludge transportation is added. 2. The revised Joint-PD-MR is checked, CTI confirmed that technical parameters of all the main equipment are added. 3. The revised Joint-PD-MR is checked, CTI confirmed that actual status of the project during this monitoring period is added. 4. The revised Joint-PD-MR is checked, CTI confirmed that time for project started construction, commissioning and operation for all 16 plants is added. Refer to section 4.1 of this report for detail assessment. CAR 31 is closed.				

CAR ID	32	Section no.	6.1	Date : 29/07/2022
Description of CAR				
For all the monitored parameters, the actual monitoring process and information of the monitoring devices, the QA/QC results are all missing for each parameter table. Revision is requested.				
Project participant response				Date : 24/08/2022

The actual monitoring process and information of the monitoring devices, the QA/QC results has been added accordingly, please refer to section 6.1 of the revised Joint-PD-MR (Version 02).	
Documentation provided by project participant	
/1/- version 2.0	
VVB assessment	Date: 30/08/2022
The revised Joint-PD-MR is checked, CTI confirmed that the actual monitoring process and information of the monitoring devices, the QA/QC results are all provided in all the monitored parameters table. Refer to section 4.2 of this report for detail assessment. CAR 32 is closed.	

Table 4.FAR from this verification

FAR ID	N/A	Section No.	-	Date: -
Description of FAR				
Project participant response				Date: -
Documentation provided by project participant				
VVB assessment				Date: