Verification report form of GS project	
BASIC INFORMATION	
Title and GS reference number of the project activity	Indonesia Domestic Biogas Programme of Activities (IDBP VPA-2) GS reference number: program: 1172 VPA-2: 5303
Version number of the verification and certification report	4
Completion date of the verification and certification report	10/11/2022
Monitoring period number and duration of this monitoring period	5th Monitoring; 01/01/2021-31/12/2021
Version number of the monitoring report to which this report applies	0.5
Crediting period of the project activity corresponding to this monitoring period	02/01/2017 – 01/01/2024
Project participants	Yayasan Rumah Energi (YRE)
Host Party	Indonesia
Applied methodologies and standardized baselines	Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 1
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A
Estimated amount of ex-ante GHG emission reductions or GHG removals for this monitoring period in the included VPAs covered in this report	27,311 tCO2e
Certified amount of GHG emission reductions or GHG removals for this monitoring period for the included VPAs covered in this report	14,804 tCO2e
Name and GS reference number of the VVB	AENOR International, S.A.U (GS S.No.: 3)
Name, position and signature of the approver of the verification and certification report	José Luis Fuentes  Climate Change Manager

SECTION A. Executive summary

AENOR INTERNACIONAL S.A.U (AENOR) has been contracted by Yayasan Rumah Energi (YRE) to undertake this verification of the registered GS programme titled “Indonesia Domestic Biogas Programme of Activities” (VPA-2 GS reference number: 5303). The verification has been performed through a process of document review based on the MR, initially submitted for verification and the subsequent revisions, registered VPA-DD, follow-up interviews, resolution of outstanding issues and issuance of the verification report.

The programme’s aim is to disseminate domestic biodigesters as a local, sustainable energy source. These biodigesters are fed with a mixture of water and animal manure that is anaerobically digested, and the generated biogas is intended for use as fuel for cooking. The biodigester type implemented is the fixed-dome type, constructed with bricks and stone masonry.

The project is located in Indonesia, in the following provinces:

Province	Latitude	Longitude	Number of biodigesters
Lampung	5° 27' 0.0000" S	105° 16' 0.0120" E	170
West Java*	6° 54' 53.0784" S	107° 36' 35.3160" E	290
Central Java	7° 47' 49.4448" S	110° 22' 13.9044" E	230
East Java	7° 15' 1.6020" S	112° 46' 7.8420" E	958
Bali	8° 24' 34.2648" S	115° 11' 20.1084" E	258
Nusa Tenggara Barat	8° 39' 10.5602" S	117° 21' 41.9314" E	2,041
Nusa Tenggara Timur	8° 39' 26.575" S	121° 4' 45.732" E	470
Yogyakarta	7° 47' 49.4448" S	110° 22' 13.9044" E	964
South Sulawesi**	5° 8' 51.5940" S	119° 25' 57.8352" E	885

*Provinces Banten and Sumatera Selatan are included in the West Java province
**Province Kalimantan Tengah, Gorontalo, Central Sulawesi and Southeast Sulawesi is included in South Sulawesi province

The VPA aims to reduce GHG emissions by using biogas systems to replace traditional thermal energy generation methods by making biogas systems affordable and available to households. It meets the small-scale thresholds set forth by the CDM i.e., 15 MW or 45 MW_{th} for the renewable energy component and an emissions cap of 60,000 tCO2e for the methane avoidance component as shown in the table below:

$\mathbf{Th_{cap}} = \frac{\mathbf{E}}{\mathbf{t}}$ $\quad where \quad \mathbf{E} = \eta * H_b * V_b$		
Where:	Value:	Comments:
t = hours/day usage	2.74	See “Crosstab BUS by Province_18May2016.xls”, sheet “raw_data” cell J2683. Fixed for future verifications
η = efficiency of stove	50%	Indonesian Government standard on stove efficiency
H_b = heat of combustion per unit volume of biogas	21.0 MJ/m^3	Derived from IPCC defaults
V_b = volume of biogas	1.46 m^3/day	Data provided by Hivos
E = Energy available from the biogas system	15.37 MJ/day	Calculated
E_{th} =	4.27 kWh/day	1 MJ = 0.2778 kWh
Th_{cap} =	1.56 kW_{th}	Given a 2.74 hour/day usage
Total capacity	8.512 MW_{th}	Given 6,266 units installed

Scope of the verification

The scope of the verification is to assess all aspects described in the Gold Standard for the global Goals, Principles and Requirements, v1.2. related to all aspects of GHG reduction involved in the programme. The verification is based on the validated project design document Version 1.4, (hereinafter validated or registered VPA-DD) and previous verification report. These documents were also reviewed against the requirements of Gold Standard for the Global Goals, Community Services Activities Requirements, v1.2.

The objectives of this verification are to verify and certify emission reductions reported for the programme for the monitoring period from 01/01/2021 to 31/12/2021 (first and last day included); and to verify that the data reported are complete and transparent.

This report summarizes the findings of the verification of the programme, performed on the basis of GS criteria as well as criteria given to provide for consistent programme operations, monitoring and reporting. UNFCCC criteria refer to the Kyoto Protocol, the CDM rules and modalities as agreed in the Bonn Agreement, the Marrakech Accords and the CDM Executive Board's decisions.

The information in these documents is reviewed against Gold Standard for the Global Goals, Principles and Requirements, v1.2., the recommendations in the CDM Validation and Verification Standard for programmes of activities version 3.0 Kyoto Protocol requirements and associated interpretations. AENOR has used a risk-based approach in the verification, focusing on the identification of significant risks and reliability of project monitoring and generations of GS-VERs.

The verification is not meant to provide any consulting towards the client. However, stated request for clarifications and/or corrective actions may provide input for improvement of the monitoring.

Verification process

The verification team determines the conformity of the actual programme and its operation with the validated project design document. The audit team has, by means of a desk review and remote interviews, assessed that all physical features of the proposed programme proposed in the VPA-DD are in place, and that the project participants have operated the programme as per the VPA-DD. Thus, the verification team has concluded that the programme was implemented and operated as per VPA-DD, and that all physical features of the project are in place.

The verification team, based on the remote interviews and document review, was able to conclude that the programme has been commissioned and implemented as per the VPA-DD. The start date of this monitoring period is 01/01/2021 and considering the end date of the previous monitoring period, the verification team concludes that it is correct.

The verification team has planned and performed the work to obtain the information and explanations that is considered necessary to provide sufficient evidence for it to give reasonable assurance that the amount of calculated GHG emission reductions for this monitoring period were fairly stated.

The monitoring report for this monitoring period is in compliance with the monitoring plan of the registered VPA-DD. The programme was registered by applying the GS methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 1 and the verification was carried out in accordance with the applied methodology. It was confirmed that the programme during the current verification is in accordance with the applicability criteria of the methodology.

The project participants were requested to address all verification findings and finally provided the verification team with sufficient evidence to determine that the applicable GS requirements have been met. The project participant modified the initial MR to resolve the verification team concerns and resubmitted a final version of the MR. AENOR has prepared this report based on the final MR.

All Corrective Action Requests (CAR) and Clarification Actions (CL) have been checked by the verification team and have been adequately resolved.

All the verification findings are summarized in section C.5 below and documented in more detail in Appendix 3.

As a final step of the verification, the verification report has to undergo internal quality control by means of a technical review following the procedures of AENOR. The technical reviewer is a competent person from AENOR, independent of the team that carried out the verification of the project activity.

In AENOR's opinion, the GHG emissions reductions of the monitoring period from 01 January 2021 – 31 December 2021, were calculated correctly and amount 14,804 tonnes of CO2 equivalent.

SECTION B. Verification team, technical reviewer and approver

B.1. Verification team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interviews	Verification findings
1.	Team Leader	IR	Arroyo Bovea	Marina	AENOR	Yes	No	Yes	Yes
2.	Verifier	IR	Llorente Pérez	Elena	AENOR	Yes	No	No	Yes

B.2. Technical reviewer and approver of the verification and certification report

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of VVB or outsourced entity)
1.	Technical reviewer	IR	Arribas Alonso	Luis Javier	AENOR
2.	Approver	IR	Fuentes Pérez	José Luis	AENOR

SECTION C. Means of verification

C.1. Desk/document review

The verification was performed primarily based on the review of the monitoring report and the supporting documentation. This process included review of data and information presented to verify their completeness and review of the monitoring plan and monitoring methodology, paying particular attention to the frequency of measurements, the quality of metering equipment including calibration requirements, and the QA/QC procedures, and an evaluation of data management and the QA/QC system in the context of their influence on the generation and reporting of emission reduction.

The following documents were reviewed as part of the verification:

- MR, including excel calculations
- Gold Standard for the Global Goals Safeguarding Principles & Requirements Version 1.2
- Technologies and Practices to Displace Decentralized Thermal Energy Consumption

(TPDDTEC), version 1
- Decision 3/CMP.1 and relevant decisions and guidelines from the EB
- Gold Standard for the Global Goals, Principles and Requirements, v1.2.
- Gold Standard for the Global Goals, Community Services Activities Requirements, v1.2.

The initial version of the monitoring report version 0.1 submitted by the project participant and additional background documents related to the emission reductions are reviewed as an initial step of the verification process. The subsequent step involved the identification of corrective action requests and clarification requests (CAR and CL) which are presented in Appendix 4 of this report. In response, PP has submitted MR version 0.4. A complete list of all documents and records reviewed is as attached in Appendix 3 of this report.

C.2. On-site inspection

In the case of this verification process of the programme, in accordance with the Rule Update: Covid 19: Interim Measures latest version 5 published on 21.12.2021 (and valid up to 30/06/2022, based on the alternative measures proposed in paragraph 4.1.1. b), the on-site visit has been replaced by remote interviews as a means of verification, due to the extraordinary world situation as consequence of the Coronavirus, and specifically in Indonesia.

Besides AENOR has considered additional circumstances to justify that the onsite visit to the programme during this verification process is not required, as we detail below:

a) It is not an initial verification;

b) There has been no change in the design of the project, scope, boundary of reporting or any other issue affects the estimated emission reductions since the previous verified statement;

c) The GHG emission reductions achieved by the programme are lower than the estimated in the registered VPA-DD.

Due to the circumstances and the reasons explained above, the verification team of AENOR considers that alternative means of audit indicated in paragraph 4.1.1.b of the Rule (i.e. document review of project documentation and remote interviews (by telephone, email, online communication systems, etc) will be enough for the purpose of verification of the compliance of the project with GS rules, and thus a site visit is not necessary.

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Batur Romzini	Chabi (Bibah)	YRE	13/05/2022	Verify the correct implementation of the project and the monitoring plan.	Marina Arroyo Bovea
2.	Bakhtary	Haseeb	ClimateFocus (Consultant)			

Additionally, the audit team interviewed a sample of the biodigesters' owners regarding the following matters:

- Information received about the program prior to participating in it
- Signature of contract and voluntary participation
- Opinion on the project
- Participation in survey and trainings
- Use of biogas and any problems that might have been encountered
- SDG benefits
- Grievance mechanism

The results of the interviews provided insight on the programme and allowed to verify the information stated on the MR. The local communities are generally satisfied with the project, participate voluntarily, and have a signed contract with the PP. They are aware of the SDG benefits and are able to contact the designated members of the team in case there is an issue.

C.4. Sampling approach

The sampling plan is developed using guidance of the applied GS methodology and the registered VPA-DD which prescribes a 90% confidence interval with a 10% error margin. The CMS sample size is 6,266 units. With these parameters, a sample size of 68 units is considered sufficient.

The units were randomly selected using the "random" function in excel for conservativeness. Moreover, an additional 25% of the selected sample was randomly picked by the verification team in order to ensure a significant sample in case any issue might arise difficulting interviews due to the covid situation.

List of randomly selected 68 households for interview are included below:

IDBP PLANT CODE	PLANT SIZE (m3)	NAME OF OWNER	VILLAGE	SUBDISTRICT	DISTRICT	PROVINCE
MSP0268	8	M. Abdul rahman	Ngeposari	Semanu	Gunungkidul	Di yogyakarta
HIP0185	4	Jumadi / sri suryani	Merdiko rejo	Tempel	Sleman	Di yogyakarta
NGP1531	10	Mispan	Pagersari	Ngantang	Malang	Jawa timur
PBP1413	4	Apbd, sulistyo	Ngawu	Playen	Gunung kidul	Di yogyakarta
MSP0010	12	Suryanto, kristo agung dusun pagersari 01/05	Waleng	Girimarto	Wonogiri	Jawa tengah
RNP0332	4	Husna	Padangloang	Patampanua	Pinrang	Sulawesi selatan
MKP0377	4	Anak agung putu subawa	Bongkasa pertiwi	Abiansemal	Badung	Bali
KUP0271	4	H.ramli tona	Tritiro	Bontotiro	Bulukumba	Sulawesi selatan
HIP0131	4	Legiman/jumiasih	Hargo binangun	Pakem	Sleman	Di yogyakarta
LHP0049	6	Abdul rahman	Nijang	Unter iwes	Sumbawa	Nusa tenggara barat
YRP0813	1	Eno pinori	Sesait	Kayangan	Lombok utara	Nusa tenggara barat
WRP0022	4	Sabri	Pesanggrahan	Montong gading	Lombok timur	Nusa tenggara barat
HIP0007	4	Maryono	Sendangagung	Minggir	Sleman	Di yogyakarta
SGP0452	4	Asiah	Setiling	Batukliang utara	Lombok tengah	Nusa tenggara barat
BPP0073	6	Kiva arini	Wukir harjo	Prambanan	Sleman	Di yogyakarta
KIP0075	8	Pjt ii elis daryati	Margamukti	Pangalengan	Bandung	Jawa barat
UBP0061	4	Agus	Tarumajaya	Kertasari	Bandung	Jawa barat
PHP0136	4	Apbd, martha tumba	Dandang	Sabbang	Luwu utara	Sulawesi selatan
TKP0212	6	Kawit santoso	Kaliwungu	Kaliwungu	Semarang	Jawa tengah
RNP0316	4	Latuo	Paria	Duampanua	Pinrang	Sulawesi selatan
HSP0177	4	Petrus pakereng	Tema tana	Wewewa timur	Sumba barat daya	Nusa tenggara timur
HPP0045	8	Winarno	Temuwangi	Pedan	Klaten	Jawa tengah
SGP0632	4	Nursiah	Beleka	Praya timur	Lombok tengah	Nusa tenggara barat

IDBP PLANT CODE	PLANT SIZE (m3)	NAME OF OWNER	VILLAGE	SUBDISTRICT	DISTRICT	PROVINCE
MKP0286	4	Gusti md cakra	Warnasari	Melaya	Jembrana	Bali
NGP1461	12	Rohman	Tulungrejo	Ngantang	Malang	Jawa timur
DSP0116	2	Miratih	Pringga jurang	Montong gading	Lombok timur	Nusa tenggara barat
PCP0369	4	Eyok	Cendi manik	Sekotong	Lombok barat	Nusa tenggara barat
UBP0010	12	Nana, eutik	Margamukti	Pangalengan	Bandung	Jawa barat
PMP0045	4	Deden setiana budi	Warnasari	Pangalengan	Kabupaten bandung	Jawa barat
KKP0207	4	Wanja, odu walu	Hanggaroru	Rindi	Sumba timur	Nusa tenggara timur
HSP0180	4	Thimotius bili	Omba rade	Wewewa tengah	Sumba barat daya	Nusa tenggara timur
MSP0215	4	Sutamso	Selopamioro	Imogiri	Bantul	Di yogyakarta
YRP0016	1	Hajidin	Pendua	Kayangan	Lombok utara	Nusa tenggara barat
DSP0075	2	Abdul muin	Montong betok	Montong gading	Lombok timur	Nusa tenggara barat
SGP0591	4	Sahnur	Kuripan utara	Kuripan	Lombok barat	Nusa tenggara barat
KJP0770	8	, Astuli	Gading kembar	Jabung	Malang	Jawa timur
YSP1627	4	H.m. Badri	Pesanggrahan	Montong gading	Lombok timur	Nusa tenggara barat
SLP0014	8	I kadek redana	Tiga	Susut	Bangli	Bali
YRP0382	1	Adi rahman	Kayangan	Kayangan	Lombok utara	Nusa tenggara barat
WRP0002	4	Aq. Sunardi	Pesanggrahan	Montong gading	Lombok timur	Nusa tenggara barat
LWP0434	4	Kaba, matius m.l.	Kabali dana	Wewewa barat	Sumba barat daya	Nusa tenggara timur
YRE0028	4	Saimin	Bandung rejo	Boliyohuto	Gorontalo	Gorontalo
TWP0551	6	Gimun	Nyawangan	Sendang	Tulungagung	Jawa timur
DSP0151	2	Inaq ashar	Sugian	Sambelia	Lombok timur	Nusa tenggara barat
SKP0925	8	Yono drm	Kalipucang	Tutur	Pasuruan	Jawa timur
LHP0102	4	Syamsuddin umar	Brangbiji	Sumbawa	Sumbawa	Nusa tenggara barat
SQP0011	6	Hendra bayu p	Senganten	Gondang	Bojonegoro	Jawa timur
REP0345	4	Mansur	Masago	Patimpeng	Bone	Sulawesi selatan
TKP0198	6	Dalianto	Mukiran	Kaliwungu	Salatiga	Jawa tengah
WRP0116	4	Maswan	Rarang	Terara	Lombok timur	Nusa tenggara barat
LWP0403	4	Mone, dominggus	Waimaringi	Kodi balaghar	Sumba barat daya	Nusa tenggara timur
KPP0434	6	Sunadi	Gunungsari	Bumiaji	Batu	Jawa timur
QTP0330	6	Harsono	Bawu	Kemusu	Boyolali	Jawa tengah
RGP0178	4	Tri muryani	Srisawahan	Punggur	Lampung tengah	Lampung
TWP0589	6	Triono	Krosok	Sendang	Tulungagung	Jawa timur
SGP0614	4	Subutiah	Setiling	Batukliang utara	Lombok tengah	Nusa tenggara barat
RNP0423	4	Badduali/sarodding	Maccirinna	Patampanua	Pinrang	Sulawesi selatan

IDBP PLANT CODE	PLANT SIZE (m3)	NAME OF OWNER	VILLAGE	SUBDISTRICT	DISTRICT	PROVINCE
TPP0073	8	Boyadi	Gemaharjo	Tegalombo	Pacitan	Jawa timur
KIP0088	6	Pupung/epon	Sukajaya	Lembang	Bandung barat	Jawa barat
KTP0219	12	Tiagus	Welulang	Lumbang	Pasuruan	Jawa timur
KIP0124	4	Wawan	Tarumajaya	Kertasari	Bandung	Jawa barat
HIP0095	4	Dalijo / evi	Gadingharjo	Sanden	Bantul	Di yogyakarta
SGP0481	4	Jamaluddin	Jago	Praya	Lombok tengah	Nusa tenggara barat
ONP0189	6	Supri	Samirono	Getasan	Semarang	Jawa tengah
YRP0773	1	Muriadi	Sesait	Kayangan	Lombok utara	Nusa tenggara barat
NGP1463	12	Parno	Tulungrejo	Ngantang	Malang	Jawa timur
MSP0202	4	Narto semito	Kalitekuk	Semin	Gunung kidul	Di yogyakarta
WRP0101	4	Sahrum	Pengadangan	Pringgasela	Lombok timur	Nusa tenggara barat

Due to the exceptional situation of Covid-19 and the difficulties to access certain regions of Indonesia/obtaining response from households, an alternate list for sampling was provided in case more were necessary:

IDBP PLANT CODE	PLANT SIZE (m3)	NAME OF OWNER	VILLAGE	SUBDISTRICT	DISTRICT	PROVINCE
YRP0136	1	Sudirman	Santong	Kayangan	Lombok utara	Nusa tenggara barat
KPP0611	12	Bmp suliono	Selorejo	Dau	Malang	Jawa timur
PBP1303	4	, Sis setiyo	Umbul harjo	Cangkringan	Sleman	Di yogyakarta
WRP0028	4	Aq. Ros / mawar	Pesanggrahan	Montong gading	Lombok timur	Nusa tenggara barat
LHP0111	4	Budiman	Brangbiji	Sumbawa	Sumbawa	Nusa tenggara barat
DSP0223	2	Hairiah	Lepak	Sakra timur	Lombok timur	Nusa tenggara barat
SGP0358	8	Smkn 1 batu kliang uatar	Mas-mas	Batukliang utara	Lombok tengah	Nusa tenggara barat
YRP0643	1	Inaq rinati	Santong	Kayangan	Lombok utara	Nusa tenggara barat
NGP1530	10	Sutaji	Pagersari	Ngantang	Malang	Jawa timur
BAP0080	6	Bmp purwanto	Wonorejo	Wates	Kediri	Jawa timur
PHP0100	4	Apbd sunarto	Sidomukti	Bone-bone	Luwu utara	Sulawesi selatan
SGP0618	4	Abdurrahman	Karang sidemen	Batukliang utara	Lombok tengah	Nusa tenggara barat
ONP0152	6	Csr panijan	Ngawen	Ngawen	Blora	Jawa tengah
LHP0025	4	Mahrip	Sekokat	Labangka	Sumbawa	Nusa tenggara barat

IDBP PLANT CODE	PLANT SIZE (m3)	NAME OF OWNER	VILLAGE	SUBDISTRICT	DISTRICT	PROVINCE
YRP0378	1	Saparudin	Kayangan	Kayangan	Lombok utara	Nusa tenggara barat
MKP0315	4	Ni wayan suriyani	Bongkasa pertiwi	Abiansemal	Badung	Bali
BAP0114	8	Anjarwadi	Banyuarang	Ngoro	Jombang	Jawa timur

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

All documentation provided by the PP was assessed against the applicable version of the relevant GS guidance document. Several clarification requests (CL) and corrective action requests (CAR) were raised and submitted to the PP, which addressed them either by providing to the audit team with the requested information or by making the appropriate corrections. Updated versions of the documentation were submitted by the PP and the audit team reassessed them against the guidance documentation. This process was repeated iteratively until all CL and CAR were fully closed. Specifically, 2 CLs and 4 CARs were raised.

All findings issued by the AENOR audit team during the validation process have been closed and can be found in the Appendix 4 of this report.

C.5.1. Forward Action Requests from previous verification report

The audit team has reviewed the previous verification report and validation report observed that there were no FARs pending to close from the previous verification and the validation report.

SECTION D. Verification findings

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

Means of verification	The verification team has determined whether the monitoring report was completed using the valid version of the applicable monitoring report form. The verification team has checked whether all the sections of the monitoring report follow the guidelines provided in the template itself.
Conclusion	PP has used the valid version of the MR template prescribed by GS which is current and active. The monitoring report has been prepared as per the instructions provided in the GS requirements. The verification team has concluded that the monitoring report was completed using the valid version of the applicable monitoring report form and is followed the guidelines given in the template.

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

The audit team has reviewed the previous verification report and validation report observed that there were no FARs pending to close from the previous verification and the validation report of the renewal of the crediting period.

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

Means of verification	The compliance of the VPA implementation with the registered project design document was verified through the interviews and desk-review of documents provided by the project participants. (All revised documents are listed in Appendix 3). The audit team reviewed that the main technical features of the programme and other equipment are operational as per specifications mentioned in the VPA-DD.

	The audit team verified the correct operation of the VPA by reviewing different technical documentation, surveys, procedures and registries. Project participant has provided all necessary information and documentation to demonstrate compliance of the implemented registered VPA and monitored GHG emission with all applicable requirements to the methodology and applicable GS4GG rules.
Conclusion	AENOR confirms that: • The implementation status and equipment installation of the programme are consistent with the registered VPA-DD. • The actual operation of the Programme is as per the registered VPA-DD. • Information (data and variables) provided in the monitoring report is in accordance with that stated in the registered VPA-DD. • The actual GHG emission reductions achieved by the programme in the current monitoring period that have been reported in the monitoring report are lower that the estimated for the same monitoring period in the VPA-DD.

D.4. Post-registration changes

D.4.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

Not applicable.

D.4.2. Corrections

Not applicable.

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

Not applicable.

D.4.4. Permanent changes from registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

Not applicable.

D.4.5. Changes to the project design

A design change approved by GS on 21/07/2020 was introduced in this MP.

This design change was introduced to allow plastic digesters and capacity sizes below 4 m^3, which were not initially mentioned on the VPA-DD, but it was included in the PoA.

AENOR has checked all information in the MR along with the validation report of the PRC and approval from GS, and considers it correct.

D.5. Compliance of the registered monitoring plan with applied methodologies, applied standardized baselines, and other applied methodological regulatory documents

Means of verification	The compliance of monitoring plan with the monitoring methodology was verified by reviewing whether the VPA was in accordance with the applied methodology and if any other monitoring aspect of the VPA that is not specified in the methodology was established.

	During the desk review, the audit team was able to review different records and assess whether the monitoring methodology has been adequately considered and documented. The audit team verified the monitoring of reductions in GHG emissions to result from the proposed VPA and whether it was implemented in accordance with the registered VPA-DD and the project participant is recording the data and parameters following the monitoring methodology applied. Regarding this issue, the verification team reviewed: • The monitoring of reductions in GHG emissions to result from the proposed VPA was implemented in accordance with the Monitoring Plan. • The monitoring plan and the applied methodology had been properly implemented and followed by the project participant. • Trainings were performed in order to ensure the correct monitoring of parameters. • All parameters stated in the monitoring plan, the applied methodology and other requirements have been sufficiently monitored and updated. • The responsibilities and authorities for monitoring and reporting were in accordance with the responsibilities and authorities stated in the monitoring plan. The audit team has verified that the monitoring of reductions in GHG emissions to result from the proposed GS programme is implemented in accordance with the monitoring plan.
Conclusion	The verification team reviewed whether the monitoring plan was in accordance with the applied methodology and any other monitoring aspect of the programme that is not specified in the methodology was established. The verification team confirms that the monitoring plan is in accordance with the applied methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 1 based on the following reasons: • During the desk review monitoring parameters included in the applied methodology were compared with the ones included in the Monitoring plan of the registered VPA-DD, and they were found consistent. • The monitoring plan perfectly fulfils the criteria stated in the monitoring methodology. • No other relevant aspects for monitoring not included in the methodology were identified. Therefore, AENOR confirms that the monitoring plan is in compliance with the approved methodology applied by the GS programme and applicable tool.

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

D.6.1. Data and parameters fixed ex ante or at renewal of crediting period

Means of verification

Data and parameters fixed ex ante were verified through desk-review of final version of monitoring report, registered VPA-DD and methodology applied. The fixed parameters used for calculating the emission reduction have been indicated and verified as follows:

Data/parameter:	**$f_{NRB,y}$**
Unit	%
Description	Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using nationally approved methods
Source of data	Reports, surveys, and government data
Value(s) applied)	64.8
Choice of data or measurement methods and procedures	Calculated as per guidance of the applied methodology: $f_{NRB,y} = \frac{NRB}{NRB+DRB}$
Purpose of data	For the calculation of the fraction of non-renewable biomass

Additional comments	Since the MR of VPA2 still covers the first crediting period of VPA-2, the PP refers to the fNRB of 64.8% as per the approved VPA-DD.

Data / Parameter	**NRB**
Unit	m^3
Description	Non-renewable woody biomass
Source of data	FAO (2010) Global Forest Resources Assessment 2010 Country Report Indonesia; calculation
Value(s) applied	55,984,649
Choice of data or Measurement methods and procedures	NRB can be calculated by subtracting the DRB of 30,411,351 m3 from By of 86,396,000 m3. By is the amount of firewood removed from forests which amounts to 86,396,000 m3 (FAO, 2010).
Purpose of data	For the calculation of the fraction of non-renewable biomass
Additional comment	-

Data / Parameter	**DRB**
Unit	m^3
Description	Demonstrably renewable woody biomass
Source of data	FAO (2010) Global Forest Resources Assessment 2010 Country Report Indonesia; calculation
Value(s) applied	30,411,351
Choice of data or Measurement methods and procedures	The annual sustainable yield from the plantations is determined to be 35,490,000 m^3, in line with 35,378,000 m^3 estimated by ITTO (2009). The more conservative number 35,490,000 m^3 is multiplied by the fraction of wood fuel removals from total wood removals (85.57%) reported by FAO, yielding yields the demonstrably renewable biomass (DRB) of 30,411,351 m3.
Purpose of data	For the calculation of the fraction of non-renewable biomass
Additional comment	-

Data / Parameter	**$EF_{b1, bio}$**
Unit	tCO2/TJ
Description	Emission factor of the woody biomass used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	112
Choice of data or Measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comment	IPCC (2006); May be updated according to any future changes by the IPCC. CO2 and non-CO2 emissions factors for charcoal may be estimated from project specific monitoring or alternatively by researching a conservative wood to charcoal production ratio (from IPCC, credible published literature, project-relevant measurement reports, or project-specific monitoring) and multiplying this value by the pertinent EF for wood

Data/parameter:	**$EF_{p1, bio}$**

Unit	tCO2/TJ
Description	Emission factor of the woody biomass used in the project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	112
Choice of data or measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC.

Data/parameter:	NCV_{bio}
Unit	TJ/tonne
Description	Net calorific value of the non-renewable biomass used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	0.015
Choice of data or measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC

Data/parameter:	**$EF_{b1, fuel}$**
Unit	tCO2/TJ
Description	Emission factor of fossil fuels used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	Kerosene = 71.9 LPG = 63.1
Choice of data or measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC

Data/parameter:	**$EF_{p1, fuel}$**
Unit	tCO2/TJ
Description	Emission factor of fossil fuels used in the project scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	Kerosene = 71.9 LPG = 63.1

Choice of data or measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC

Data/parameter:	**NCV_{fuel}**
Unit	TJ/tonne
Description	Net calorific value of fossil fuels used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied)	Kerosene = 0.0438 LPG = 0.0473
Choice of data or measurement methods and procedures	As per requirement of the methodology and Table 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC

Data/parameter:	**$\eta_{biogas\ stove}$**
Unit	%
Description	Combustion efficiency of the biogas stove introduced by the VPA
Source of data	LIPI Stove Report, 2010; Indonesian Government standard on stove efficiency
Value(s) applied)	50
Choice of data or measurement methods and procedures	A comprehensive combustion efficiency test of the biogas stove introduced by the VPA was conducted in 2010 by LIPI, a governmental testing institute. The resulting efficiency of the biogas stoves was 52%. The Indonesian Government standard on stove efficiency indicates an efficiency of 50% is prevalent. The latter has been used to be conservative.
Purpose of data	For the calculation of emission reductions derived from fuel usage
Additional comments	-

Data/parameter:	**$EF_{awms,T}$**
Unit	kg CH_4
Description	Emission factor for the defined livestock population category T by average temperature (27.1°C)
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Indonesian Meteorological Climatological and Geophysical Agency

	Value(s) applied)	Dairy cows = 31 Other cattle = 1 Buffalo = 2 Market swine = 7 Goats = 0.22 Sheep = 0.20 Poultry = 0.02
	Choice of data or measurement methods and procedures	As per requirement of the methodology and sourced from Tables 10.A-4 through A-9., Chapter 10, Volume 4 of the 2006 IPCC Guidelines The IPCC is a standard, credible source of emissions factors.
	Purpose of data	For the calculation of emission reductions derived from fuel usage
	Additional comments	IPCC (2006); May be updated according to any future changes by the IPCC.
	Verification of data generation, aggregation and recording in this case is not applicable since they are fixed parameters from the registered VPA-DD. The values for the fixed parameters in the registered VPA-DD have been correctly used in calculation and reporting of emissions reductions for the monitoring period verified.	
Conclusion	Data parameters fixed at validation, used for calculating the emission reduction, are in accordance with registered VPA-DD, methodology and other requirements. All data sources and assumptions are appropriate, and calculations are correct as applicable to the proposed programme.	

D.6.2. Data and parameters monitored

Means of verification	The audit team carried out a review of information flows for generating, aggregating and reporting the monitoring parameters to assess a completeness of monitoring in line with the monitoring plan and the applied methodology, including: • The measurement/determination method used. • Relevant monitoring equipment, their features and the control and calibration procedures. • Significant inaccuracies occurred in case of measured or estimated values of some parameters. • Measuring, reading and/or recording frequency. • QA/QC procedures applied to prevent or identify and correct any errors or omissions in the reported monitoring parameters. Data and monitored parameters were verified through the interviews and desk-review. The monitoring system and all applied procedures are in compliance with the monitoring plan and the applied methodology based on the information included in the final monitoring report. The list of all monitored parameters and the means of verification used are detailed as follows:

Data/parameter:	**$U_{p1,y}$**
Unit	Fraction
Description	Cumulative usage rate for technologies in project scenario p1 in year y, based on cumulative adoption rate and drop off rate (fraction)
Measured/calculated/default	Measured
Source of data	Collected through the annual Biogas User Survey; Biogas User Survey 2022 results have been used for the purpose of the ex-ante calculation – 20220420 BUS_Tabulation 2021_v.01.xlsx | Sheet Drop-off | Cell E22 - E26

Value(s) of monitored parameter	0.9172 With the following usage rate for each age group: **Age group** / **Usage rate** Age group 5 / 0.8387 Age group 4 / 0.9032 Age group 3 / 0.8387 Age group 2 / 0.9677 Age group 1 / 1
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	
QA/QC procedures:	The usage rate of thermal applications is monitored annually using survey methods to satisfy a 90/10 precision/confidence, following the 'Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities' (EB 69, Annex 4).
Purpose of data:	To account for the impact of dropped off units in the emission reduction calculation
Additional comments:	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data/parameter:	**$N_{p1,y}$**
Unit	Number
Description	Cumulative project operational rate included in the project database for project scenario p1 against baseline scenario b1 in year y
Measured/calculated/default	Measured
Source of data	IDBP database. See 20220217 ER Calculation VPA2 MP5 CP1_v02.xls sheet GS VER 2021, cell E86
Value(s) of monitored parameter	Reported as a result of (Nop1,y * **$U_{p1,y}$** *(Op1,y / 365)), which equals (6,266* 0.9172*362.36/365) = 5,706
Monitoring equipment	NA
Measuring/reading/recording frequency:	Continuous
Calculation method (if applicable):	
QA/QC procedures:	The supplier shall provide hard copies of the 'Household Agreement and the Completion Report to the CME, who will be responsible for entering data for the number of units installed each month into the centralised record-keeping database. It will be the CME's responsibility to ensure that data is entered correctly and to follow-up with the supplier if there are errors or missing data. The database will not allow double-entries of the serial numbers. All original hard copies are filed and stored.
Purpose of data:	To account for non-operational units in the emission reduction calculation

Additional comments:	

Data/parameter:	**$No_{p1,y}$**
Unit	Number
Description	Cumulative number of project technologies included in the project database for project scenario p in year y
Measured/calculated/default	Measured
Source of data	20220201_IDBP_Database_VPA2.xlsx
Value(s) of monitored parameter	6,266
Monitoring equipment	NA
Measuring/reading/recording frequency:	Continuous
Calculation method (if applicable):	
QA/QC procedures:	The supplier shall provide hard copies of the 'Household Agreement and the Completion Report to the CME, who will be responsible for entering data for the number of units installed each month into the centralised record-keeping database. This will enable the calculation of the cumulative number of units in the VPA.
Purpose of data:	To account for the cumulative number of units in the emission reduction calculation
Additional comments:	The actual cumulative number of biodigester operational days will be confirmed upon verification.

Data/parameter:	**$O_{p1,y}$**
Unit	Number
Description	The average technology-days during which the biodigesters are operational for project scenario p1 against baseline scenario b1 in year y
Measured/calculated/default	Measured
Source of data	See 20220217 ER Calculation VPA2 MP5 CP1_v02.xls sheet GS VER 2021, cell E85
Value(s) of monitored parameter	362.36
Monitoring equipment	NA
Measuring/reading/recording frequency:	Continuous
Calculation method (if applicable):	The actual cumulative number of biodigester non-operational days will be confirmed upon verification. The equation to calculate this is ($O_{p,y}$ = 365 – non-operational days). Non-operational days are based on the number of observations of technical drop-offs, which need to be repaired within a 15 day period. For number of incidences reported during this MP, see: "20220201_IDBP_Database_VPA2" | sheet "PLANTMAINT" | cell L42301
QA/QC procedures:	As per procedures of the IDBP database
Purpose of data:	Emission reduction calculation
Additional comments:	-

Data/parameter:	**$LE_{p1,y}$**
Unit	tCO_2e/year

Description	Leakage in project scenario p during year y
Measured/calculated/default	Measured
Source of data	Collected through the annual Biogas User Survey. 20220217 ER Calculation VPA2 MP5 CP1_v02.xls sheet GS VER 2021, cell E77
Value(s) of monitored parameter	0.073
Monitoring equipment	NA
Measuring/reading/recording frequency:	Every two years
Calculation method (if applicable):	
QA/QC procedures:	The leakage will be monitored once every two years using survey methods to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	To account for leakage
Additional comments:	-

Data/parameter:	**$N_{T,h}$**
Unit	Number
Description	Number of animals of livestock category T in premise h
Measured/calculated/default	Measured
Source of data	BUS 2021 – "20220420 BUS_Tabulation 2021_v.01.xlsx" | sheet "Tabulation"| cell AA119
Value(s) of monitored parameter	Cow = 6.07
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Analysis of animal ownership from the BUS 2021 shows that dairy cows are the dominant type of animal owned by almost all biodigesters users (82%). Given the marginal emission impact of the latter two categories and for conservativeness, only methane emissions from dairy cows will be considered in this emissions reduction calculation. Methane emissions from secondary and any following animal types are not included for conservativeness. This means that the total average number of animals kept amounted to 6.07 cows per household.
QA/QC procedures:	Ex-post value to be derived from the Biogas User Survey
Purpose of data:	To calculate the baseline and project emissions associated with animal waste handling
Additional comments:	

Data/parameter:	**PL**
Unit	%
Description	Physical leakage of the biodigester
Measured/calculated/default	Default
Source of data	IPCC
Value(s) of monitored parameter	Estimated using a 10% default rate of total methane production
Monitoring equipment	N/A

Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	
QA/QC procedures:	
Purpose of data:	To calculate the physical leakage associated with the use of the technology
Additional comments:	As per Annex 6 of the applied methodology

Data/parameter:	**$BB_{b1,bio}$**
Unit	Tonnes/year
Description	Amount of woody biomass used in the baseline scenario 1: households
Measured/calculated/default	Measured
Source of data	KPT Survey, December 2021- January 2022 – "Biogas KPT & Non 2021.xls" | sheet 90-30 test | cell F50
Value(s) of monitored parameter	0.549
Monitoring equipment	NA
Measuring/reading/recording frequency:	Updated every two years through the Baseline Performance Field Test
Calculation method (if applicable):	
QA/QC procedures:	Ex-post value to be determined through the Baseline Performance Field Test
Purpose of data:	To calculate the baseline emissions associated with fuel use
Additional comments:	

Data/parameter:	**$BB_{b1,fuel}$**
Unit	Tonnes/year
Description	Amount of fossil fuels used in the baseline scenario 1: households
Measured/calculated/default	Measured
Source of data	KPT Survey, December 2021- January 2022 – "Biogas KPT & Non 2021.xls" | sheet 90-30 test | cells L50 and I50
Value(s) of monitored parameter	LPG = 0.168 Kerosene = 0.007
Monitoring equipment	NA
Measuring/reading/recording frequency:	Updated every two years through the Baseline Performance Field Test
Calculation method (if applicable):	
QA/QC procedures:	The following conversion factor for kerosene is applied: 1 liter = 0.82 kg[1] Ex-post value to be determined through the Baseline Performance Field Test.
Purpose of data:	To calculate the baseline emissions associated with fuel use
Additional comments:	

Data/parameter:	**$BB_{p1,fuel}$**
Unit	Tonnes

[1] Lawrence Berkeley National Laboratory (2003) 'Technical and Economic Performance Analysis of Kerosene Lamps and Alternative Approaches to Illumination in Developing Countries'

Description	Quantity of fossil fuel consumed in project scenario 1 during year y, in tonnes
Measured/calculated/default	Measured
Source of data	KPT Survey, December 2021- January 2022 – "Biogas KPT & Non 2021.xls" | sheet 90-30 test | cells AC103 and Z103
Value(s) of monitored parameter	LPG: 0.1 Kerosene: 0.000
Monitoring equipment	Weight scale
Measuring/reading/recording frequency:	Updated every two years through the Project Performance Field Test
Calculation method (if applicable):	Project KPT was executed in December 2021- January 2022 targeting 93 households. A weight scale manufactured by Wei Hang, Portable Electronic Scale company, was applied.
QA/QC procedures:	Shall be in line with Section 7 of the applied methodology.
Purpose of data:	To calculate the project emissions associated with fuel use
Additional comments:	

Data/parameter:	**$BB_{p1,bio}$**
Unit	Tonnes
Description	Quantity of biomass consumed in project scenario p during year y, in tonnes
Measured/calculated/default	Measured
Source of data	KPT Survey, December 2021- January 2022 – "Biogas KPT & Non 2021.xls" | sheet 90-30 test | cell W103
Value(s) of monitored parameter	0.300
Monitoring equipment	Weight scale
Measuring/reading/recording frequency:	Updated every two years through the Project Performance Field Test
Calculation method (if applicable):	Project KPT was executed in December 2021- January 2022 targeting 93 households. A weight scale manufactured by Wei Hang, Portable Electronic Scale company, was applied.
QA/QC procedures:	Shall be in line with Section 7 of the applied methodology.
Purpose of data:	To calculate the project emissions associated with fuel use
Additional comments:	

Data/parameter:	**$MS_{P,S,K}$**
Unit	%
Description	Fraction of livestock category T's manure not treated in bio-digester, in climate region k
Measured/calculated/default	Measured
Source of data	"20220420 BUS_Tabulation 2021_v.01.xlsx s" | sheet "Tabulation"| cell V274
Value(s) of monitored parameter	17.2
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Survey
QA/QC procedures:	-
Purpose of data:	To calculate the project emissions associated with bio-slurry
Additional comments:	-

Data/parameter:	$MS_{T,S,k}$
Unit	%
Description	Fraction of livestock category T's manure fed into the bio-digester, S in climate region k
Measured/calculated/default	Measured
Source of data	"20220420 BUS_Tabulation 2021_v.01.xlsx s" | sheet "Tabulation"| cell V273
Value(s) of monitored parameter	82.8
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Survey
QA/QC procedures:	
Purpose of data:	To calculate the project emissions associated with bio-slurry
Additional comments:	Applicable to VPAs applying Tier 2 only

Data/parameter:	GWP_{CH4}
Unit	-
Description	Global Warming Potential of methane
Measured/calculated/default	Default
Source of data	IPCC AR5 (2014)
Value(s) of monitored parameter	28
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	IPCC default
QA/QC procedures:	
Purpose of data:	To calculate the baseline and project emissions associated with animal waste handling
Additional comments:	May be updated according to any future changes by the IPCC

Data/parameter:	Bio
Unit	%
Description	Use of bio-slurry
Measured/calculated/default	Measured
Source of data	"20220420 BUS_Tabulation 2021_v.01.xlsx" | sheet "Tabulation"| cell T326
Value(s) of monitored parameter	68.5
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	To be updated through the annual Biogas User Survey
QA/QC procedures:	The application of bio-slurry shall be monitored according the applied methodology, and in line with the approach used

	in project GS 1083. If there is any anaerobic use/storage of bio-slurry under anaerobic conditions reported from the monitoring survey, project emissions shall be accounted for accordingly.
Purpose of data:	To be used for the calculation of project emissions associated with bio-slurry usage – the CH4 emissions from the anaerobic decay of the residual organic content of digestate subjected to anaerobic storage.
Additional comments:	

SDG impact parameters:

Data/parameter:	**GS-03 Soil condition**
Unit	Number
Description	Soil condition refers to changes compared to the baseline in organic matter content.
Measured/calculated/default	Measured
Source of data	Collected through the annual Biogas User Survey. "20220420 BUS_Tabulation 2021_v.01.xlsx" | sheet "Tabulation"| cell T326
Value(s) of monitored parameter	68.5%, equivalent to 4,290 households (68.5% * 6,266 biodigesters)
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Number of users applying the final biodigester slurry on agricultural land. Data is to be collected annually.
QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	-

Data/parameter:	**GS-06 Quality of employment**
Unit	Number
Description	Quality of employment refers to changes compared to the baseline in the qualitative value of employment, such as whether the jobs resulting from the project activity are highly or poorly qualified, temporary or permanent. The proportion of employees attending vocational training programs as well as Health and Safety courses, as proven through issuance of a certificate to all constructors, will be monitored.
Measured/calculated/default	Measured
Source of data	IDBP Database. "20220201_IDBP_Database_VPA2.xls" | sheet "SPV" | cell M225
Value(s) of monitored parameter	12 vocational trainings conducted during this monitoring period (i.e., MP5, between 01/01/2021 and 31/12/2021)
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	All vocational training and Health and Safety training attendees will be issued with a certificate proving their attendance, and a record of their names, contact details and gender, will be kept as part of the CME's consolidated monitoring database. Data is to be collected annually.

QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011). Hard copies of all certificates issued will be kept by the CME.
Purpose of data:	SDG impact monitoring
Additional comments:	

Data/parameter:	**GS-07 Livelihood of the poor**
Unit	%
Description	Livelihood of the poor refers to changes compared to the baseline in living conditions, access to healthcare services including affordability and poverty alleviation.
Measured/calculated/default	Measured
Source of data	Collected through the annual Biogas User Survey. "20220420 BUS_Tabulation 2021_v.01.xlsx" | sheet "Tabulation"| cell K332 – K334
Value(s) of monitored parameter	'Worsened': 79 (equivalent to 1.3% of total units in operation) 'The same': 2,459 (equivalent to 39.2% of total units in operation) 'Improved': 3,728 (equivalent to 59.5% of total units in operation)
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Carried out as part of the annual Biogas User Survey conducted by the IDBP. As part of this survey the following question will be included: "Do you feel that your living conditions have a) improved, b) stayed the same, c) worsened; since the installation of the biogas digester?"
QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	-

Data/parameter:	**GS-08 Access to affordable and clean energy services**
Unit	Number
Description	Access to energy services refer to changes in unsustainable energy use. This will be monitored through the number of biogas units commissioned.
Measured/calculated/default	
Source of data	Collected through the IDBP Database. "20220201_IDBP_Database_VPA2.xls" | sheet "Master VPA-2" |cell H6758
Value(s) of monitored parameter	6,266
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	As in the assessment of parameter 'N' above, the unique serial number of each installation will be recorded upon commissioning and entered into the electronic database, with clear divisions between VPAs. This will allow a count of the number of systems commissioned.

QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	

Data/parameter:	**GS-09 Human and institutional capacity**
Unit	Number
Description	Changes compared to the baseline in education and skills, gender equality and empowerment. Women spend much of their time collecting firewood and cooking, and have little spare time to undertake activities that stimulate personal and entrepreneurial development. The number of women attending the Operation and Maintenance training as well as the bio-slurry utilization training will be monitored.
Measured/calculated/default	Measured
Source of data	IDBP Database; "20220201_IDBP_Database_VPA2.xls" | sheet "O&M training"| cell H5266
Value(s) of monitored parameter	304 Women attending Operation and Maintenance training in this monitoring period (i.e., MP5, between 01/01/2021 and 31/12/2021) 1,381 Women attending Operation and Maintenance training in the period 2017-2021
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	As per the VPA-DD, the number of women attending the Operation and Maintenance training as well as the bio-slurry utilization training are monitored to indicate changes in gender equality. This data concerns cumulative results over the VPAs lifetime
QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	-

Data/parameter:	**GS-10 Quantitative employment and income generation**
Unit	Number
Description	The number of jobs generated by within the IDBP as well as the number of constructors employed will be monitored. To evidence income generation, the number of users selling biodigester slurry on the market will be monitored.
Measured/calculated/default	Annual
Source of data	Employment records and through the IDBP Database; Biogas User Survey. "20220201_IDBP_Database_VPA2.xls"| sheet "SPV"| cell "M224" "20220201_IDBP_Database_VPA2.xls"| sheet "SPV"| cell "M229"

Value(s) of monitored parameter	162 number of direct jobs created by the VPA during the monitoring period 01/01/2021 – 31/12/2021 63 number of constructors employed under the VPA during the monitoring period 01/01/2021 – 31/12/2021 As per the VPA-DD, the number of jobs generated by the VPA as well as the number of constructors employed is monitored. To evidence income generation, the number of users selling biodigester slurry on the market is also monitored.
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	Through the Biogas User Survey, the number of users selling biodigester slurry on the market will be monitored.
QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	-

Data/parameter:	**GS-12 Technology transfer and technological self-reliance**
Unit	Number
Description	Refers to changes compared to the baseline in activities that build usable and sustainable know-how in a region/country for a technology, where know-how was previously lacking. The number of constructors trained and users attending the operation and maintenance training will be monitored. Also, the entities outside of the programme in general and technical training about the functioning of the biodigester technology to promote knowledge dissemination and strengthen the domestic biogas market will be monitored.
Measured/calculated/default	NA
Source of data	Training records and through the IDBP Database; Biogas User Survey. " 20220201_IDBP_Database_VPA2 xls" | sheet "O&M training" | cells H5266 and H5272
Value(s) of monitored parameter	867 users trained during this monitoring period (i.e., MP5, from 01/01/2021 to 31/21/2021) 5,255 users trained in the period 2017-2021
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annually
Calculation method (if applicable):	Records will be kept of all staff and their attendance at the vocational training programmes. All attendees will be issued with a certificate proving attendance and skills gained. Monitoring of this parameter will be combined with the monitoring of GS- 10. A record of all training held, and attendees, will be kept in the programme database.
QA/QC procedures:	This will be monitored through sampling to satisfy the requirements put forth by the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (11/04/2011).
Purpose of data:	SDG impact monitoring
Additional comments:	-

Data / Parameter	GS-13 Establishment of sustainable food production area
Unit	Hectare
Description	Area with application of bio-slurry or compost.
Source of data	See: “20220420 GS-13 calculation 2021.xls” | sheet ‘Analysis’ | cell C29
Value(s) applied	122.20
Measurement methods and procedures	Area of agricultural land with application of final biodigester slurry. Data is to be collected annually.
Monitoring frequency	Annually.
QA/QC procedures	This will be monitored through sampling to satisfy the requirements put forth by the methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption (11/04/2011).
Purpose of data	SDG impact monitoring.
Additional comment	

Data / Parameter	GS-14 Time saved
Unit	%
Description	The share of women indicating to save time by not having to collect biomass for cooking purposes after the installation of the biodigester.
Source of data	Collected through the annual Biogas User Survey. See: 20220420 BUS_Tabulation 2021_v.01.xlsx | sheet ‘Tabulation | cells K339 and M339
Value(s) applied	93.5 (equivalent to 5,862 women)
Measurement methods and procedures	The BUS will ask respondents whether after the installation of a biodigester women (1) collect firewood (2) does not collect firewood
Monitoring frequency	Annually
QA/QC procedures	This will be monitored through sampling to satisfy the requirements put forth by the methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption (11/04/2011).
Purpose of data	SDG impact monitoring.
Additional comment	

Data / Parameter	GS-15 Productive use of time
Unit	%
Description	Share of women indicating to use the additional saved time that has been freed up by not having to collect biomass for cooking purposes for income generating activities.
Source of data	Collected through the annual Biogas User Survey. 20220420 BUS_Tabulation 2021_v.01.xlsx | sheet ‘Tabulation | cells K345 and M345
Value(s) applied	32.3 (equivalent to 2,023 women)
Measurement methods and procedures	The BUS will ask respondents how they use the saved time, with income generation activities as one of the possible responses.
Monitoring frequency	Annually.
QA/QC procedures	This will be monitored through sampling to satisfy the requirements put forth by the methodology Technologies and Practices to Displace Decentralized Thermal Energy Consumption (11/04/2011).
Purpose of data	SDG impact monitoring.
Additional comment	

All data and supporting evidence were verified and found consistent and correct, which are detailed in the appendix 3 of this report.

Conclusion	AENOR verification team confirms that: • The monitoring has been carried out in accordance with the monitoring plan in the registered VPA-DD. • All parameters required by the monitoring plan have been measured / determined without material misstatements and in line with all applicable standards and relevant requirements. • The registered monitoring plan has been properly implemented and followed by the project participants. • All parameters stated in the registered monitoring have been monitored and updated as applicable • The equipment used for monitoring is controlled and calibrated in accordance with the registered monitoring plan, the applied methodology and the national standard. • Monitoring results are consistently recorded as per the approved frequency. • Quality assurance and quality control procedures have been applied in accordance with the registered monitoring plan.

D.6.3. Implementation of sampling plan

Means of verification	The verification team has checked whether the PP has applied a sampling approach to determine the monitored values. Further it has been checked whether the PP has correctly applied the implemented sampling plan including (i) description of the implemented sampling design (ii) collected data (iii) analysis of collected data (iv) demonstration on whether the required confidence/precision has been met.
Conclusion	The sampling has been developed according to the stated in the VPA-DD and the supporting information. The sampling results must meet the 90% confidence and 10% precision limit. This analysis was carried out per user group (i.e. households, SMEs, communities) and differentiated between small-scale digesters (defined as capacity up to 12m^3) and medium-scale digesters (defined as capacities larger than 12m^3). The households were selected using simple random sampling applied cross all nine provinces in accordance with TPDDTEC v1. The PP demonstrates, by means of the simple random that the 90/10 confidence/precision is achieved so the estimated values are considered correct and no need for additional sampling efforts is required.

D.7. Assessment of data and calculation of SDG Impacts

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

Means of verification

Baseline estimates were calculated according to the GS4GG as follows:

SDG indicator	GS indicator	Baseline situation
SDG 13: Climate action	Climate change	Baseline emissions from fuel consumption: 34,057 tCO2e
SDG 7: Affordable and Clean Energy	GS-08 Access to affordable and clean energy services	No access to biodigester technology. Combustion of LPG, kerosene and biomass continues to lead to particulate matter and carbon monoxide pollution and deforestation.
	GS-12 Technology transfer and technological self-reliance	No training opportunities and transfer of technology in the biogas sector.

	SDG 5: Gender Equality	GS-09 Human and institutional capacity	No development as women spent much of their time collecting biomass and cooking, and remain with little spare time to undertake activities that stimulate personal and entrepreneurial development.
		GS-14 Time saved	No time savings, as women spend a significant proportion of their time having to collect biomass for cooking purposes.
		GS-15 Productive use of time	No productive use of time as women lack spare time to pursue income generating activities.
	SDG 2: No Hunger	GS-03 Soil condition	No slurry is used as fertilizer on agricultural land (in terms of number of farmers).
		GS-13 Establishment of sustainable food production area	No slurry is used as fertilizer on agricultural land (in terms of area).
	SDG 1: No Poverty	GS-06 Quality of employment	No training and employment opportunities linked to biogas market.
		GS-07 Livelihood of the poor	Livelihood of the poor is unchanged.
		GS-10 Quantitative employment and income generation	No training and employment opportunities linked to biogas market.
	SDG 13: Baseline emissions from fuel consumption: $BE_{b1CO2,y} = (\sum_b BB_{b1,fuel} * NCV_{fuel} * EF_{b1,fuel}) + (BB_{b1,bio} * NCV_{bio} * EF_{b1,bio} * f_{NRB})$ Baseline emissions from the animal waste management system: $\mathbf{BE_{b1,CH4,y}} = GWP_{CH4} * \sum_T (EF_{awms,T} * N_{T,h})$ Together amounting to (after correcting for drop off): 34,057 tCO2e		
Conclusion	AENOR verification team confirms that: • A complete set of data for the monitoring period is available. • Calculations of baseline emissions have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology. • Appropriate emission factor, IPCC default values and other reference values have been correctly applied. • No errors, miscalculations, omissions, misstatements or incomplete information have been identified.		

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

Means of verification	Project estimates were calculated according to the GS4GG as follows:		
	SDG indicator	**GS indicator**	**Project situation**
	SDG13: Climate action	Climate change	18,853 tCO2e

SDG 7: Affordable and Clean Energy	GS-08 Access to affordable and clean energy services	6,266 biodigester technologies installed
	GS-12 Technology transfer and technological self-reliance	867 users attending training during monitoring period 5,255 users attending training during the lifetime of the project
SDG 5: Gender Equality	GS-09 Human and institutional capacity	304 women attend the Operation and Maintenance training during monitoring period 1,381 women attend the Operation and Maintenance training during the lifetime of the project
	GS-14 Time saved	5,862 women reporting to have saved time
	GS-15 Productive use of time	2,023 women reporting to have more time for productive use
SDG 2: No Hunger	GS-03 Soil condition	4,290 households use bio-slurry on land
	GS-13 Establishment of sustainable food production area	122.20 hectares applying bio-slurry
SDG 1: No Poverty	GS-06 Quality of employment	12 vocational trainings conducted in the 2021 during monitoring period 75 vocational trainings conducted during the lifetime of the project
	GS-07 Livelihood of the poor	'Worsened': 79 (equivalent to 1.3% of total units in operation) 'The same': 2,459 (equivalent to 39.2% of total units in operation) 'Improved': 3,728 (equivalent to 59.5% of total units in operation during MP5
	GS-10 Quantitative employment and income generation	63 number of constructors employed under the VPA during the monitoring period 162 direct jobs created by the VPA during the monitoring period

<u>SDG 13:</u>

Project emissions from fuel consumption:

$$PE_{p1,CO2,y} = \sum(BB_{p1,fuel} * NCV_{fuel} * EF_{p1,fuel}) + (BB_{p1,bio} * NCV_{bio} * EF_{p1,bio} * f_{NRB})$$

Project emissions from the animal waste management system:

	$\mathbf{PE_{p1,CH4,y}} = \mathrm{GWP_{CH4}} * \sum(\mathrm{N_{T,h,y}} * \mathrm{EF_{awms,T}}) * \mathrm{PL_y} + \sum(\mathrm{N_{T,h,y}} * \mathrm{EF_{awms,T}}) * (1 - \eta_{new\ stove})(1 - \mathrm{PL_y}) + \mathrm{PE_{awms,NT}}$ Together amounting to after correcting for drop off: 18,863 tCO_2e SDG 7: 6,266 biodigester technologies installed, calculated by tracking in the IDBP database all eligible biodigesters installed until 31/12/2021. 867 users attending training during monitoring period 01/01/2021 – 31/12/2021 according to IDBP database all O&M trainings. SDG 5: 304 women attend training during monitoring period 01/01/2021 – 31/12/2021 according to IDBP database all O&M trainings. 5,862 women reporting to have saved time, as calculated by the BUS survey responses with 93.5% of the 6,266 biodigesters installed (0.935* 6,266 = 5,862) 2,023 women reporting to have more time for productive use, as calculated by the BUS survey responses with 32.3% of the 6,266 biodigesters installed (0.323* 6,266 = 4,290) SDG 2: 4,290 households use bio-slurry on land, as calculated by the BUS survey responses with 68.5% of the 6,266 biodigesters installed (0.685* 6,266 = 4,290) 122.20 hectares applying bio-slurry, per month, calculated by correcting the total units (6,266) by the drop-off rate (10.08%) and multiplying it by bio-slurry usage as fertilizer according to the BUS (67%) and finally applying conversions to get to hectares SDG 1: 12 people attending vocational training in the monitoring period 01/01/2021 – 31/12/2021 according to IDBP database Livelihood of the poor 'worsened': 79 (equivalent to 1.3% of total units in operation), 'the same': 2,459 (equivalent to 39.2% of total units in operation), 'improved': 3,728 (equivalent to 59.5% of total units in operation) according to survey 63 number of constructors employed during MP5 according to IDBP database 162 number of direct jobs created during MP5 according to IDBP database The audit team has checked all the specific calculations and databases to verify the results of the SDG contributions.
Conclusion	AENOR verification team confirms that: • A complete set of data for the monitoring period is available. • Calculations of project emissions have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology. • Appropriate emission factor, IPCC default values and other reference values have been correctly applied. • No errors, miscalculations, omissions, misstatements or incomplete information has been identified. In AENOR's opinion, monitoring practices are deemed appropriate and consistent with the monitoring plan.

D.7.3. Calculation of leakage GHG emissions

Means of verification	Leakage is monitored every 2 years using survey methods to satisfy the requirements put forth by the methodology TPDDTEC v1 requirements. Leakage is calculated as the usage of non-renewable biomass and fossil fuel. The leakage assessment was carried out as part of the BUS 2021. Leakage per household per year was calculated as a quantitative emissions volume (tCO_2e).

	According to the results reported by households that are neighbors to biogas users, 11/129 of the households uses more fuel (biomass, LPG, and/or kerosene) because of the neighbor having a biogas digester. This amounts to household leakage emissions of 0.073 tCO_2e per year.
Conclusion	AENOR verification team confirms that: • A complete set of data for the monitoring period is available. • Calculations of emission reductions have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology. • Appropriate emission factor, IPCC default values and other reference values have been correctly applied. No errors, miscalculations, omissions, misstatements or incomplete information has been identified.

D.7.4. Summary calculation of net benefits or direct calculation for each SDG Impact

Means of verification

Net benefits were calculated according to the GS4GG as follows:

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
SDG13: Climate action	Climate change	Baseline emissions from fuel consumption: 34,057 tCO_2e	18,863 tCO2e	14,804tCO_2e
SDG 7: Affordable and Clean Energy	GS-08 Access to affordable and clean energy services	No access to biodigester technology. Combustion of LPG, kerosene and biomass continues to lead to particulate matter and carbon monoxide pollution and deforestation.	1,582 biodigester technologies installed during MP 6,266 total biodigester technologies installed	1,582 biodigester technologies installed during MP 6,266 total biodigester technologies installed
	GS-12 Technology transfer and technological self-reliance	No training opportunities and transfer of technology in the biogas sector.	867 users attending training during monitoring period 5,255 users attending training during the lifetime of the project	867 users attending training during monitoring period 5,255 users attending training during the lifetime of the project
SDG 5: Gender Equality	GS-09 Human and institutional capacity	No development as women spent much of their time collecting biomass and cooking, and remain with little spare time to undertake activities that stimulate personal and entrepreneurial development.	304 women attend the Operation and Maintenance training during monitoring period 1,381 women attend the Operation and Maintenance training during the lifetime of the project	304 women attend the Operation and Maintenance training during monitoring period 1,381 women attend the Operation and Maintenance training during the lifetime of the project

	GS-14 Time saved	No time savings, as women spend a significant proportion of their time having to collect biomass for cooking purposes.	5,862 women reporting to have saved time	5,862 women reporting to have saved time
	GS-15 Productive use of time	No productive use of time as women lack spare time to pursue income generating activities.	2,023 women reporting to have more time for productive use	2,023 women reporting to have more time for productive use
SDG 2: No Hunger	GS-03 Soil condition	No slurry is used as fertilizer on agricultural land (in terms of number of farmers).	4,290 households use bio-slurry on land	4,290 households use bio-slurry on land
	GS-13 Establishment of sustainable food production area	No slurry is used as fertilizer on agricultural land (in terms of area).	122.20 hectares applying bio-slurry	122.20 hectares applying bio-slurry
SDG 1: No Poverty	GS-06 Quality of employment	No training and employment opportunities linked to biogas market.	12 in the 2021 during monitoring period 75 people attending vocational training during the lifetime of the project	12 in the 2021 during monitoring period 75 people attending vocational training during the lifetime of the project
	GS-07 Livelihood of the poor	Livelihood of the poor is unchanged.	'Worsened': 79 (equivalent to 1.3% of total units in operation) 'The same': 2,459 (equivalent to 39.2% of total units in operation) 'Improved': 3,728 (equivalent to 59.5% of total units in operation)	'Worsened': 79 (equivalent to 1.3% of total units in operation) 'The same': 2,459 (equivalent to 39.2% of total units in operation) 'Improved': 3,728 (equivalent to 59.5% of total units in operation)
	GS-10 Quantitative employment and income generation	No training and employment opportunities linked to biogas market.	162 number of direct jobs created by the VPA during MR 63 number of constructors employed by the VPA during MR	162 number of direct jobs created by the VPA during MR 63 number of constructors employed by the VPA during MR

<u>SDG 13</u>:
Emissions reductions

ER y = BE y – PE y – LE y

Together amounting to after correcting for drop off: 14,804tCO2e.

Conclusion	AENOR verification team confirms that: • A complete set of data for the monitoring period is available. • Calculations of emission reductions have been carried out in accordance with the formulae and methods described in the monitoring plan and the applied methodology. • Appropriate emission factor, IPCC default values and other reference values have been correctly applied. • No errors, miscalculations, omissions, misstatements or incomplete information has been identified.

D.7.5. Comparison of actual SDG Impacts with estimates in validated PDD

Means of verification

As the VPA-DDs was developed prior to the GS for Global Goals, most of the ex-ante SDG impacts were not reported.

	Current MP	PDD estimate
SDG 13	Total emission reduction: 14,804 tCO_2e/ this monitoring period.	Total emission reduction: 27**,**311 tCO_2e/ ex ante estimate in PDD.
SDG 7: Affordable and Clean Energy	1,582 biodigester technologies installed during MP 6,266 total biodigester technologies installed	No access to biodigester technology. Combustion of LPG, kerosene and biomass continues to lead to particulate matter and carbon monoxide pollution and deforestation
	867 users attending training.	-
SDG 5: Gender Equality	304 women attend the Operation and Maintenance training.	-
	5,862 women reporting to have saved time.	-
	2,023 women reporting to have more time for productive use.	-
SDG 2: No Hunger	4,290 households use bio-slurry on land	-
	122.20 hectares applying bio-slurry, per month	-
SDG 1: No Poverty	162 number of direct jobs created by the VPA 63 number of constructors employed by the VPA	-
	'Worsened': 79 (equivalent to 1.3% of total units in operation) 'The same': 2,459 (equivalent to 39.2% of total units in operation) 'Improved': 3,728 (equivalent to 59.5% of total units in operation)	-
	12 vocational trainings conducted	-

Conclusion	AENOR verification team confirms that: A comparison of actual GHG emission reductions or net anthropogenic GHG removal of the programme achieved during this monitoring period with the estimates in the registered VPA-DD has been provided. The verification team considers that the calculation of the comparison is correct.

D.8. Local stakeholder consultation process

During the interviews with local people, the verification team confirmed that local stakeholders are satisfied about the project, in general, because although some specific situation can cause discomfort in someone the communication channels with the project staff are clear and available and appropriate answer to each problem is provided quickly.
The audit team verified the external communication record for 2021 where all the input/grievances received are registered and the evidence of some of the answers delivered to the input/grievances received. The 34 ongoing grievances have also been checked as well and 7 have been solved in the first months of 2022, while the remaining are in the process of being repaired by the CPO. YRE field officer made Term of reference for repair activity as work order for the CPO to do reparation. Hence it is accepted by the verification team.

D.9. Double counting of emissions reductions

According to the rules stated by Gold Standard, to assure that no double counting could happen AENOR has verified during the desk review and the interviews that all biogas obtained from the programme is registered and used by the GS project and no other carbon project exist close that can use the same biogas or installations. Furthermore, in the IDBP database each biodigester has a unique number and different construction date. Thus, the database does not allow for double-entries. The records of biogas units were checked by the audit team.
AENOR thus confirms that there is no evidence of a possible double counting of emissions reductions during the current monitoring period.

SECTION E. Internal quality control

Following the completion of the assessment process by the verification team, all documentation undergoes an internal quality control through a technical review before the request for Issuance of VERs is submitted. The Technical reviewer is a qualified member of AENOR, independent from the team that carried out the verification of the programme. The technical reviewer or the team appointed for the technical review is qualified in the technical area(s) and sectoral scope(s) of the programme.

SECTION F. Verification opinion

AENOR has performed the verification of the emission reductions of the “Indonesia Domestic Biogas Programme of Activities” VPA-2 GS5303 for the period from 01/01/2021-31/12/2021.
The verification approach was based on the requirements as defined under the Kyoto Protocol, Marrakech accord, Montreal COP/MOP 1, Nairobi COP/MOP 2 as well as those defined by the CDM Executive Board and GS4GG.
AENOR planned and performed the verification to obtain the information, explanations and evidence considered necessary to provide sufficient evidence to give reasonable assurance that the amount of GHG emission reductions for the reporting period, prepared on the basis of both the registered monitoring plan and the final monitoring report, are fairly stated.
AENOR conducted the verification with regard to the monitoring plan included in the registered Project Design Document, and the applied methodology as registered for the project. This assessment included:

- Collection of evidence supporting the reported data
- Checking whether the provisions of the monitoring plan, were consistently and appropriately applied.

AENOR has verified whether the information included in the final monitoring report is correct and that the emissions reductions achieved have been determined correctly.
In AENOR's opinion, GHG emissions reported for the project in the final monitoring report are fairly stated.
The GHG emission reductions were calculated without material errors, omissions or misstatements in a conservative and appropriate manner according to the approved methodology “Technologies

and Practices to Displace Decentralized Thermal Energy Consumption" version 1 and the monitoring plan and formulae provided in the registered VPA-DD.

SECTION G. Certification statement

AENOR is able to certify that the results achieved by the "Indonesia Domestic Biogas Programme of Activities" VPA-2 GS5303 for the period from 01/01/2021-31/12/2021 amount to 14,804 GS VERs.

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 13: Climate Action	Climate change	14,804	VER
SDG 7: Affordable and Clean Energy	GS-08 Access to affordable and clean energy services	1,582	Biodigesters installed
	GS-12 Technology transfer and technological self-reliance	867	Users attending training
SDG 5: Gender Equality	GS-09 Human and institutional capacity	304	Women attending Operation and Maintenance training
	GS-14 Time saved	5,862	Women reporting to have saved time
	GS-15 Productive use of time	2,023	Women reporting to have more time for productive use
SDG 2: No Hunger	GS-03 Soil condition	4,290	Households using bio-slurry on land
	GS-13 Establishment of sustainable food production area	122.20	Hectares applying bio-slurry, per month
SDG 1: No Poverty	GS-06 Quality of employment	12	Vocational trainings conducted
	GS-07 Livelihood of the poor	79 2,459 3,728	'Worsened' 'The same' 'Improved'
	GS-10 Quantitative employment and income generation	162 63	Number of direct jobs created by the VPA Number of constructors employed by the VPA

Madrid, November 10, 2022.

Marina Arroyo Bovea
Team Leader

José Luis Fuentes
Climate Change Manager

Appendix 1. Abbreviations

Abbreviations	Full texts
AENOR	AENOR INTERNACIONAL S.A.U.
BUS	Biogas User Survey
CAR	Corrective action requests
CDM	Clean development mechansim
CL	Clarification
EF	Emissions factor
ER	Emission reduction
FAR	Forward action request
GHG	Greenhouse gas
GS	Gold Standard
GS4GG	Gold Standard for Global Goals
GWP	Global warming potential
IDBP	Indonesia Domestic Biogas Programme of Activities
IPCC	Intergovernmental Panel on Climate Change
IR	Internal resources
KPT	Kitchen Performance Test
LPG	Liquified petroleum gas
MP	Monitoring Period
MR	Monitoring Report
MW	Megawatt
N/A	Not applicable
PoA	Programme of activities
PDD	Project Design Document
PP	Project proponent
PRC	Post Registration Change
QA/QC	Quality assessment/quality control

SDG	Sustainable development goals
tCO2	Tons of Carbon Dioxide
TJ	Tera Joules
TPDDTECC	Technologies and Practices to Displace Decentralized Thermal Energy Consumption version 1
UNFCCC	United Nations Framework Convention on Climate Change
VER	Verified Emission Reduction(s)
VPA	Validated project design document
VPA-DD	Component project design document
VVB	Verification and Validation Bodies
YRE	Yayasan Rumah Energi

Appendix 2. Competence of team members and technical reviewers

CERTIFICATE OF QUALIFICATION

Subject: Verification and Technical Review Team for “Indonesia Domestic Biogas Programme of Activities (IDBP) (GS 1174)”

Madrid, 06/10/2022

Hereby I confirm the following records of qualification, according to Gold Standard approved Validation and Verification Bodies and in relation with the verification process of the above mentioned programme:

Name: Marina Arroyo Bovea

GS Team Leader: Yes

GS Validator: N/A

GS Verifier: Yes

GS Technical Reviewer: N/A

External Technical Expert: N/A

Technical areas related with the project activity:

Community Service Activities

Jose Luis Fuentes
Climate Change Manager

CERTIFICATE OF QUALIFICATION

Subject: Verification and Technical Review Team for “Indonesia Domestic Biogas Programme of Activities (IDBP) (GS 1174)”

Madrid, 06/10/2022

Hereby I confirm the following records of qualification, according to Gold Standard approved Validation and Verification Bodies and in relation with the verification process of the above mentioned programme:

Name: Elena Llorente Pérez

GS Team Leader: N/A

GS Validator: N/A

GS Verifier: Yes

GS Technical Reviewer: N/A

External Technical Expert: N/A

Technical areas related with the project activity:

Community Service Activities

Jose Luis Fuentes
Climate Change Manager

CERTIFICATE OF QUALIFICATION

Subject: Verification and Technical Review Team for “Indonesia Domestic Biogas Programme of Activities (IDBP) (GS 1174)”

Madrid, 06/10/2022

Hereby I confirm the following records of qualification, according to Gold Standard approved Validation and Verification Bodies and in relation with the verification process of the above mentioned programme:

Name: Luis Javier Arribas Alonso

GS Team Leader: N/A

GS Validator: N/A

GS Verifier: N/A

GS Technical Reviewer: Yes

External Technical Expert: N/A

Technical areas related with the project activity:

Community Service Activities

Jose Luis Fuentes
Climate Change Manager

Appendix 3. Documents reviewed or referenced

Author	Title	References to the document
PP	Registered GS VPA-DD	version 1.5
PP	Monitoring plan registered	version 1.5
PP	Monitoring report	version 0.1
PP	Monitoring report	version 0.5
PP	ER Calculation VPA2 MP5 CP1	version 3
PP	BUS Tabulation 2021	version 1
PP	GS-13 calculation 2021	-
PP	Biogas KPT & Non 2021	-
PP	IDBP Database VPA2	-
PP	Reparation report	-
PP	Grievance mechanism	-
PP	34 ongoing grievance_VPA2	-
PP	Calibration method and certificates 2019, 2021	-
PP	Training reports	-
PP	KPT non-users	-
PP	KPT user biogas	-
PP	MOU Hivos-YRE	-
GS	GS5303 Design Change review	-
GS	Gold Standard for the global Goals, Principles and Requirements	version 1.2
GS	Gold Standard for the Global Goals, Community Services Activities Requirements	version 1.2
UNFCCC	CDM Validation and Verification Standard for programmes of activities	Version 03.0
TÜV NORD CERT GmbH	GS Verification and Certification report previous monitoring period	Version 1
GS	Rule update: covid 19: interim measures	Version 5
GS	Template Guide - Monitoring report	Version 1.1

GS	Technologies and Practices to Displace Decentralized Thermal Energy Consumption	version 1
IPCC	2006 IPCC Guidelines on National GHG Inventories	2006
AENOR	Remote interview questionnaires	-
UNFCCC	Guideline: Sampling and surveys for CDM project activities and programmes of activities	Version 04.0
UNFCCC	Standard Sampling and surveys for CDM project activities and programmes of activities	Version 09.0

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

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

FAR ID		**Date:**
Description of FAR		
NA		
Project participant response		**Date:**
Documentation provided by project participant		
VVB assessment		**Date:**

Table 2. CAR from this verification

CAR ID	01	**Date:** 27/05/2022
Description of CAR		
The following sections are not in accordance with the GS template: 1. Page 2 "Methodology (ies) applied and version number" does not include version number of the methodology used 2. Table 2 is missing the rest of the product vintages 3. Section E.1, E.2 and E.3 do not "Under a heading for each SDG, provide sample calculations for all formulae used to calculate/estimate baseline values (SDG 13 - emissions or net baseline removals), applying actual values" 4. Section G.1 does not "Include all disputes, inputs and comments received via the approved CIGM and show how these were responded to and/or mitigated. Please clarify any items that have not been fully addressed and that require follow up action." 5. Section H is not included in GS template		
Project participant response		**Date:** 08/06/2022
1. Version number added now. 2. In the past, our practice was to include VER only from the monitoring period in Table 2 and this was accepted. 3. In Section E.1, E.2 and E.3, the formulae and sample calculations are provided in the right column. This is the approach taken in the previous MRs submitted to GS. 4. Regarding Section G.1, details of disputes, inputs and comments received via the approved CIGM and evidence of how these were responded to and/or mitigated are submitted separately as evidence. 5. Section H is now renamed to "Appendix".		
Documentation provided by project participant		
-		
DOE assessment		**Date:** 13/06/2022
1. Table has been updated and deemed correct 2. Table 2 is not in accordance with GS template Guide as it does not state the amount of Product Vintages generated in the monitoring period: "Referring to the monitoring period start and end dates in the KPI table, divide the monitoring period into calendar years and calculate the amount of Product generated in each calendar year." 3. This is accepted as Appendix provides the detail of calculations and values.		

4. Section G.1 does not "show how these were responded to and/or mitigated" nor "clarify any items that have not been fully addressed and that require follow up action"
5. Appendix has been modified and deemed correct.
6. Sections D.2, E.2, E.4, E.5, E.6 report cumulative values instead of values for the monitoring period 01/01/2021 to 31/12/2021

Project participant response	**Date:** 20/06/2022

1. Okay
2. Table 2 has been updated to include all SDG contributions
3. Okay
4. Details have been added in Section G.1 about how grievances were and are being addressed.
5. Okay
6. Sections D.2, E.2, E.4, E.5, E.6, now include values for the monitoring period 01/01/2021 to 31/12/2021 only but in some sections cumulative values also been included for context.

DOE assessment	**Date:** 27/06/2022

The MR has been updated and deemed correct. Therefore CAR 1 is closed.

CAR ID	02	**Date:** 27/05/2022

Description of CAR

The following errors or misstatements have been found on the MR:

1. Section A.4 states "this report covers the fourth monitoring period of this second crediting period" whereas this is the fifth MP
2. Value for parameter Np1,y does not match excel 20220217 ER Calculation VPA2 MP5 CP1_v01.xls
3. Section D.3 GS-09 is missing the value for the previous monitoring period, and GS-10 number of constructors employed under the VPA for the last monitoring period does not match in previous MR
4. Section G.2 states that all reported issues were fixed, however section G.1 states that there are 34 grievances ongoing

Project participant response	**Date:** 08/06/2022

1. In Section A.4 which stated, "this report covers the third monitoring period of this second crediting period", "fourth" was changed to "fifth".
2. Formula and value for parameter Np1,y was corrected.
3. GS-09 value for the previous monitoring period was added, and GS-10 number of constructors employed under the VPA for the last monitoring period does match value in previous MR. Please see Page 38 of MR here: https://platform.sustain-cert.com/public-project/1002
4. In Section G.2 corrections were made regarding the number of grievances addressed.

Documentation provided by project participant

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DOE assessment	**Date:** 13/06/2022

1. Section A.4 has been updated and deemed correct.
2. Value has been updated and deemed correct
3. Values are not in accordance with reported values in previous verification report
4. Section G.2 has been updated

Project participant response	**Date:** 20/06/2022
1. Okay 2. Okay 3. Values are corrected 4. Okay 5. Okay	
DOE assessment	**Date:** 27/06/2022
The MR has been updated and deemed correct. Therefore CAR 2 is closed.	

CAR ID	03	**Date:** 27/05/2022
Description of CAR		
The following errors or misstatements have been found on the excel 20220420_BUS_tabulation_2021: 1. Tab "Drop off" G7 does not reflect the data collected in H56 2. Tab "Drop off" S37-S53 does not consider Year 5 information		
Project participant response		**Date:** 08/06/2022
The following corrections were made in the excel 20220420_BUS_tabulation_2021: 1. Tab "Drop off" G7 was correct to reflect H56 data 2. Tab "Drop off" S37-S53 now includes Year 5		
Documentation provided by project participant		
-		
DOE assessment		**Date:** 13/06/2022
Excel 20220420_BUS_tabulation_2021 has been updated and deemed correct. Therefore CAR 3 is closed.		

CAR ID	04	**Date:** 27/05/2022
Description of CAR		
GWP_{CH4} have not been updated according to the rule update "APPLICABILITY OF GLOBAL WARMING POTENTIAL FOR GOLD STANDARD FOR THE GLOBAL GOALS PROJECTS" to IPCC AR5 values		
Project participant response		**Date:** 08/06/2022
We updated GWP_{CH4} value according to the rule update "APPLICABILITY OF GLOBAL WARMING POTENTIAL FOR GOLD STANDARD FOR THE GLOBAL GOALS PROJECTS" to 28 as per the IPCC AR5 values and updated ER calculations accordingly. This has resulted in an increased ER value for the monitoring period due to the Methane conversion factor.		
Documentation provided by project participant		
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DOE assessment		**Date:** 13/06/2022
Excel "20220217 ER Calculation VPA2 MP5 CP1_v02" tab « Bio-slurry | 2021 » states GWP 25		

Project participant response	**Date:** 20/06/2022
Value has been updated.	
DOE assessment	**Date:** 27/06/2022
Excel has been updated and deemed correct. Therefore CAR 3 is closed.	

Table 3. CL from this verification

CL ID	01	**Date:** 27/05/2022
Description of CL		
Provide evidence of the following: 1. PRC validation 2. Calibration of the scales 3. Grievance requests and resolutions 4. Values in tables 19, 20, 21, 22		
Project participant response		**Date:** 08/06/2022
1. PRC validation documents uploaded on Dropbox 2. Certificate Calibration and photos and measurement uploaded to Dropbox 3. Evidence of grievance requests and resolutions are uploaded to Dropbox 4. Evidence of values in tables 19, 20, 21, 22 uploaded on Dropbox		
Documentation provided by project participant		
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DOE assessment		**Date:** 13/06/2022
1. PRC validation "approved on 21/07/2020" has not been uploaded 2. Photos and measurements have not been uploaded. 3. Provide evidence of the monitoring of the mitigations agreed to be monitored for the 34 ongoing grievances 4. Values have been updated and deemed correct		
Project participant response		**Date:** 20/06/2022
1. PRC validation "approved on 21/07/2020" now uploaded in folder 'evidence' on Dropbox. 2. Photos have been uploaded in folder 'evidence' on Dropbox. 3. Terms for addressing the 34 grievances have been uploaded in folder 'evidence' on Dropbox as evidence. 4. Okay		
DOE assessment		**Date:** 27/06/2022
Evidence has been provided and deemed correct. Therefore CL 1 is closed.		

CL ID	02	**Date:** 27/05/2022
Description of CL		

Clarify the following: 1. The project representative is stated as "YRE" whereas on the PDD is "Hivos"	
Project participant response	**Date:** 08/06/2022
1. The project was handed over to "YRE" by "Hivos". Please see MoU for details.	
Documentation provided by project participant	
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DOE assessment	**Date:** 13/06/2022
Clarifications have been provided and deemed correct. Therefore CL 2 is closed.	

Table 4. FAR from this verification

FAR ID		**Date:** DD/MM/YYYY
Description of FAR		
NA		
Project participant response		**Date:** DD/MM/YYYY
Documentation provided by project participant		
VVB assessment		**Date:** DD/MM/YYYY