



**Verified Carbon
Standard**

VARANASI SMART CITY BIO- CONVERSION PROJECT



Project title	Varanasi Smart City Bio-Conversion Project
Project ID	4493
Monitoring period	16-June-2022 to 30-June-2023
Crediting period	16-June-2022 to 16-June-2029
Original date of issue	06-September-2023
Most recent date of issue	15-October-2024
Version	05
VCS Standard Version	VCS Standard, Version 4.6
Prepared by	Krishan Kapil, EKI Energy Service Limited

CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Project	4
1.2	Audit History.....	4
1.3	Sectoral Scope and Project Type	5
1.4	Project Eligibility	5
1.5	Project Design	6
1.6	Project Proponent	6
1.7	Other Entities Involved in the Project	6
1.8	Ownership.....	7
1.9	Project Start Date	7
1.10	Project Crediting Period	8
1.11	Project Scale and Estimated GHG Emission Reductions or Removals	8
1.12	Description of the Project Activity	9
1.13	Project Location	11
1.14	Conditions Prior to Project Initiation	11
1.15	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	11
1.16	Double Counting and Participation under Other GHG Programs	12
1.17	Double Claiming, Other Forms of Credit, and Scope 3 Emissions.....	12
1.18	Sustainable Development Contributions	13
1.19	Additional Information Relevant to the Project	15
2	SAFEGUARDS AND STAKEHOLDER ENGAGEMENT	15
2.1	Stakeholder Engagement and Consultation.....	15
2.2	Risks to Stakeholders and the Environment.....	18
2.3	Respect for Human Rights and Equity	19
2.4	Ecosystem Health	20
3	APPLICATION OF METHODOLOGY.....	21
3.1	Title and Reference of Methodology	21
3.2	Applicability of Methodology	22
3.3	Project Boundary	33
3.4	Baseline Scenario	37
3.5	Additionality	38
3.6	Methodology Deviations	40

4	IMPLEMENTATION STATUS	40
4.1	Implementation Status of the Project Activity	40
5	QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS.....	40
5.1	Baseline Emissions	40
5.2	Project Emissions	43
5.3	Leakage Emissions	49
5.4	Estimated GHG Emission Reductions and Carbon Dioxide Removals	49
6	MONITORING	50
6.1	Data and Parameters Available at Validation	50
6.2	Data and Parameters Monitored.....	57
6.3	Monitoring Plan	63
7	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	67
7.1	Data and Parameters Monitored.....	67
7.2	Baseline Emissions	70
7.3	Project Emissions	70
7.4	Leakage Emissions	71
7.5	GHG Emission Reductions and Carbon Dioxide Removals	71
	APPENDIX 1: COMMERCIAL SENSITIVE INFORMATION.....	72
	APPENDIX 2: LSC MINUTES OF MEETING.....	73

1 PROJECT DETAILS

1.1 Summary Description of the Project

Varanasi Smart City Bio-Conversion Project (hereafter referred to as the project) is a newly built methane recovery and utilization project located in village Shahanshahpur of Varanasi district In Uttar Pradesh State of India. The Project is owned by **Gobardhan Varanasi Foundation SPV¹**.

The proposed plant involves co-digestion of around 70TPD of Animal manure (Cow dung) & other feedstock such as Press-mud or Napier grass sourced from nearby farmers/dairy farms and sugar mills². The project will produce 2500-2800 kg/Day of compressed Bio gas, which shall then be supplied to retailers³ for conversion to Bio-CNG and subsequent utilisation in transport. The residual waste from biogas plant is converted into fermented organic manure (FOM) & Liquid fermented organic Manure (LFOM) and sold to nearby farmers for agriculture use purpose.

The proposed project is only claiming emission reduction credits for methane avoidance via treatment of animal manure (cow dung) only and no credits are claimed for utilisation of Press-mud or Napier grass and utilisation of biogas in transport. Hence, the purpose of the project is to avoid the emissions of methane to the atmosphere from animal manure that would have otherwise been left to decay anaerobically. The baseline scenario is the same as the scenario existing prior to the implementation of the project activity. The project activity generates GHG emission reductions through recovery of biogas, that otherwise would be vented into the atmosphere directly.

The expected total emission reduction of the Project in the first 7-year renewable crediting period (16-June-2022 to 15-June-2029) is 33,187 tCO₂e and the annual average emission reduction for the first crediting period is 4,741 tCO₂e. Emission reduction achieved during the present Monitoring period from 16-June-2022 to 30-June-2023 is estimated to be 2,806 tCO₂e.

1.2 Audit History

¹ Gobardhan Varanasi Foundation SPV is a special purpose vehicle, formed by Varanasi Nagar Nigam (VNN) and People's Response for India's Development & Empowerment (PRIDE, an initiative by Adani Foundation). As per MoU Dated June 2021. between parties, for implementation/Installation of project, land will be provided by VNN at No charges and PRIDE has provided the required CAPEX by raising its own funds through Adani Foundation without any pre-condition or considerations. VNN shall also be responsible for operation, transport, maintenance, getting necessary approvals, movement of facilities & transport etc for the project. PRIDE, may on behalf of SPV would make necessary payment to vendor/ technology providers. However, post plant successful set up, The Gobardhan Varanasi Foundation SPV shall be responsible for further plant operation, production and sale of CBG, All the profits/revenue generated and expense incurred shall vest with the SPV only.

² The use of press-mud and napier grass is envisaged only in case of emergencies or shortfall of required animal manure to maintain requisite technical requirement of biodigester.

³ Via a Biogas sale agreement between CNG retailer (GAIL and ATGL)

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	14-June-2022 ⁴	VCS	TÜV SÜD South Asia Pvt. Ltd.	NA
Verification	16-June-2022 to 30-June-2023	VCS	TÜV SÜD South Asia Pvt. Ltd.	01 Year and 14 days

1.3 Sectoral Scope and Project Type

Sectoral scope	13 (Waste handling and disposal)
Project activity type	Type III – Other Project Activities

1.4 Project Eligibility

1.4.1 General eligibility

The project activity results in GHG emission reductions included in six Kyoto Protocol greenhouse gases, which are listed under the scope of the VCS Program according to VCS Standard version 4.6

The scope of VCS programme includes

The Seven Kyoto Protocol Greenhouse gases	The project is expected to avoid Methane (CH ₄) emissions via treatment of animal manure, which would have been dumped to decay and leading to methane emission. Thus, the project is applicable to this scope.
Ozone-depleting substances (ODS)	Not applicable, CH ₄ and CO ₂ are not Ozone depleting substances.
Project activities supported by a methodology approved under the VCS Program through the methodology development and review process.	Not applicable
Project activities supported by a methodology approved under an approved GHG program, unless explicitly exclude.	The applied methodologies (AMS III AO and AMS IIID) are approved under CDM Program, which is a VCS approved GHG program.
Jurisdictional REDD+ programs and nested REDD+ projects as set out in the VCS Program document Jurisdictional and Nested REDD+ (JNR) Requirements.	Not applicable

⁴ Date of Final Validation Report

Furthermore, the project activity is not included in any of the excluded project activities, those are listed under the Table 1 of VCS Standard version 4.6. Hence the proposed project activity is eligible to register under the VCS Standard version 4.6.

1.4.2 AFOLU project eligibility

Not Applicable, as this is not AFOLU projects.

1.4.3 Transfer project eligibility

Not Applicable, as this is not a transfer project.

1.5 Project Design

Indicate if the project has been designed as:

- ☒ **Single location or installation**
- ☐ Multiple locations or project activity instances (but not a grouped project)
- ☐ Grouped project

Grouped Project Design

Not Applicable, as this is not a grouped project.

1.6 Project Proponent

Organization name	Gobardhan Varanasi Foundation SPV
Contact person	Suman Kumar Roy
Title	Project Manager
Address	Gau Ashray Kendra, Shahansapur, Tehsil- Raja Talab, Varanasi, Uttar Pradesh-221311
Telephone	gobardhanvaranasifoundationspv@gmail.com
Email	+91 9667498044

1.7 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
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Role in the project	Project Consultant
Contact person	Krishan Kapil
Title	Senior Manager
Address	NRK Business Park, 903, B-1, 9th floor, Scheme 54, PU4, Indore, Madhya Pradesh-452010
Telephone	9999415645
Email	krishan.kapil@enkingint.org, registry@enkingint.org

1.8 Ownership

As per para 3.7.1 (3) of VCS Standard version 4.6., *Project ownership arising by virtue of a statutory, property or contractual right in the plant, equipment or process that generates GHG emission reductions and/or removals (where the project proponent has not been divested of such project ownership).*

Gobardhan Varanasi Foundation SPV is a special purpose vehicle, formed by Varanasi Nagar Nigam (VNN) and People's Response for India's Development & Empowerment (PRIDE, an initiative by Adani Foundation). As per MoU Dated June 2021. between parties, for implementation/Installation of project, land will be provided by VVN at No charges and PRIDE has provided the required CAPEX by raising its own funds through Adani Foundation without any pre-condition or considerations. VVN shall also be responsible for operation, transport, maintenance, getting necessary approvals, movement of facilities & transport etc for the project. PRIDE, may on behalf of SPV would make necessary payment to vendor/ technology providers. However, post plant successful set up, The Gobardhan Varanasi Foundation SPV shall be responsible for further plant operation, production and sale of CBG, All the profits/revenue generated and expense incurred shall vest with the SPV only.

Hence, it is confirmed that the project is owned by Gobardhan Varanasi Foundation SPV and will be considered as the legal owner of this project activity. Furthermore, the Project regulatory approval (UPPCB CTO and PESO Approval) & contract of BioGas sales is the evidence justifying the ownership of the project plant.

1.9 Project Start Date

Project start date	16-June-2022
Justification	As per VCS Standard version 4.6., The project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or carbon dioxide removals. Hence, date

of biogas digester commissioning is considered as project start date.

1.10 Project Crediting Period

Crediting period	☒ Seven years, twice renewable ☐ <i>Ten years, fixed</i> ☐ <i>Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)</i>
Start and end date of first or fixed crediting period	16-June-2022 to 15-June-2029

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the estimated annual GHG emission reductions/removals (ERRs) of the project:

- ☒ **< 300,000 tCO₂e/year (project)**
☐ **≥ 300,000 tCO₂e/year (large project)**

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO ₂ e)
16-Jun-2022 to 31-December-2022	2,588
01-January-2023 to 31-December-2023	4,741
01-January-2024 to 31-December-2024	4,741
01-January-2025 to 31-December-2025	4,741
01-January-2026 to 31-December-2026	4,741
01-January-2027 to 31-December-2027	4,741
01-January-2028 to 31-December-2028	4,741
01-January-2029 to 15-Jun-2029	2,153
Total estimated ERRs during the first or fixed crediting period	33,187
Total number of years	7 Years
Average annual ERRs	4,741

1.12 Description of the Project Activity

The Project will use anaerobic treatment technology and desulfurization technology, which are suitable for organic waste fermentation and methane recovery.

The Project will use the anaerobic fermentation technology to utilize the high energy potential of animal manure (cow dung) to achieve the safety disposal and comprehensive utilization of the wastes. The anaerobic reactors are equipped with biogas recovery system. The recovered biogas will be further used as Bio-CNG in transportation application after desulfurization. The Project will produce high-energy density, clean bio-energy; Bio-slurry will be used as fertilizer by the local farmers. Main technical parameters of the project are listed in the following table

No	Major Components	Capacity/Dimension
1	Plant Civil Works consisting of the Area Development- Slurry Tank, Fertilizer preparation area, feed stock storage, Office Building, Laboratory building, Farmer training and Dormitory facility, other utilities and internal roads, etc	Slurry Tank - 17 lakh liters Raw material storage area- 55mx 60m Fertilizer Preparation Area- 40mx30m
2	GFS Digester Tank	• Diameter: 32 meters • Height: 8.5 meters • Capacity: 67 lakh liter
3	Biogas Upgradation System Package (Gas refinery system)	400 m3 /hr, (25mx 10m shed area)
4	Biogas Compression Facility	250 barg pressure output, 250 m3/hr air cooled 5 Stage Compressor
5	CBG Storage (Cascade)	4500 liters capacity- 4 nos
6	Biogas Holder System consisting of two Balloon system	Raw Gas Balloon – 2,050 m3 Purified Gas Balloon – 750 m3
7	Agitators for Feed tank and Digester's system	173 kw through 11 nos agitators

8	Weight Bridge Package Fertilizers	50 Ton for Feed inputs and finished												
9	Pumps (Mixing, slurry Transfer pumps)	11 Kw, 40 m3/hr slurry pumps												
10	LCV Filling post with Gas Metering	Filling stations with mass flow meters												
11	Gas Odorization Unit	250 liters storage with up to 1000 sm3/hr of gas flow dosing												
12	Gas Analyzer package	CH4, H2S, oxygen and gas moisture analyzer												
13	Online Crusher (macerator)	40 m3/hr, gravity flow												
14	Digester Heating System Package	130 kw heating system for up to 90 TPD of feed												
22	Open Flaring System	<table> <tr> <td>Mke</td><td colspan="2">HNB Equipment's Pvt Ltd</td></tr> <tr> <td>Description</td><td>Equipment data</td><td>Type/Model no.</td></tr> <tr> <td>Flare burner</td><td>Working pressure-up to 50 mbar, Flare capacity-250 cum/hr, Line size-100NB, Ignition –pilot burner</td><td>Aspirator HNB-FB001</td></tr> <tr> <td>PILOT BURNER</td><td>Working pressure-1-2 bar, Line size-25NB, Ignition-spark electrode, Flame sensing-thermocouple, Operation Automatic/manual</td><td>Aspirator HNB-PB - 25</td></tr> </table>	Mke	HNB Equipment's Pvt Ltd		Description	Equipment data	Type/Model no.	Flare burner	Working pressure-up to 50 mbar, Flare capacity-250 cum/hr, Line size-100NB, Ignition –pilot burner	Aspirator HNB-FB001	PILOT BURNER	Working pressure-1-2 bar, Line size-25NB, Ignition-spark electrode, Flame sensing-thermocouple, Operation Automatic/manual	Aspirator HNB-PB - 25
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The operational life of the Biogas plant is 25 years⁵. Furthermore, as per specification provided on compressor supplier (Burckhardt Compression)⁶, the compressor systems are defined lifetime

⁵ As per CERC Order dated: 23rd June 2020, life of a biogas plant is indicated as 25 yrs (page 5), Ref: https://www.cercind.gov.in/2020/regulation/159_reg.pdf

⁶ <https://www.burckhardtcompression.com/about-us/sustainability-in-practice/material-topics/3-longevity-and-cyclability/>

of more than 25 years and the average lifetime is 30 to 50 years. Hence, the technical life of Gobardhan Varanasi Foundation SPV is considered as 25 yrs.

The equipment for the Project is not transferred from another facility and the existing equipment will not be transferred to another activity, thus leakage effects are not considered.

1.13 Project Location

The project is located in the village Shahanshahpur of Varanasi district, Uttar Pradesh. The central coordinates of the location is 25° 11' 37.39" N and 82° 51' 22.39" E.



1.14 Conditions Prior to Project Initiation

The baseline scenario is the same as the scenario existing prior to the start of the implementation of the project activity. Please refer to Section 3.4 (Baseline Scenario) for details.

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

- The project activity does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Environment, Forest & Climate Change (MOEF&CC), Government of India (As per MOEF&CC Notification No. - S.O. 1533, dated 14th September 2006). As per CPCB letter regarding Classification of Industries under RED, Orange, Green and White categorization for industries⁷, *CBG plants (irrespective of the type of feeds) producing fermented organic manure (FOM) & Liquid fermented organic Manure (LFOM) as by-products* are categorized as WHITE industries, Accordingly, consent to Operate is undertaken from UP Pollution control board and provided to VVB
- Project is also implemented under GOI's Sustainable Alternative Towards Affordable Transportation "SATAT" scheme. The SATAT Scheme (Sustainable Alternative Towards Affordable Transportation)⁸ is an initiative by the government of India with the objective of setting up Compressed Biogas production plants. The Scheme was launched in October 2018

⁷ <https://cpcb.nic.in/openpdf.php?id=TGF0ZXN0RmlsZS8zNDBfMTY0MTQ1OTkzNI9tZWRpYXB0b3RvNzQzOC5QREY=>

⁸ <https://satat.co.in/satat/#/>

by the Ministry of Petroleum and Natural Gas in collaboration with several oil related public sector units like Bharat Petroleum Corporation and Hindustan Petroleum Corporation. 'SATAT' scheme on Compressed Bio Gas (CBG) encourages entrepreneurs to set up CBG plants, produce & supply CBG to Oil Marketing Companies (OMCs) for sale as automotive & industrial fuels. As explained above, SATSAT is an initiative by Government of India to Encourage entrepreneurs to set up CBG plants and is not mandatory guidelines/Regulation to implement the project by private entities. Hence, CBG project implemented by Gobardhan Varanasi Foundation SPV is voluntary initiative and is not implemented in compliance with any regulatory requirement.

- Furthermore, as project involve storage of gas cylinder, hence PESCO approval has been taken and provided to VVB
- The relevant national laws and regulations pertaining to generation of energy in India are: Solid waste management Rules, 2016⁹. However, the generation of Biogas from waste is not a legal requirement or a mandatory option. There are state and sectoral policies framed primarily to encourage waste management projects. These policies have also been developed in order to recognize the magnitude of the risks involved in the projects and to attract private investment. The current practice in India is the disposal of solid waste without any treatment or processing. Hence the rules are systematically not enforced and the non-compliance with the recommendation is widespread in the country.

Based on above provided explanation, it is concluded that the project activity is in compliance with all relevant statutory and regulatory laws applicable in the host country.

1.16 Double Counting and Participation under Other GHG Programs

1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.16.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☐ Yes ☒ No

1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

⁹ https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit?.

☐ Yes ☒ No

1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system?

☐ Yes ☒ No

1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

1.18 Sustainable Development Contributions

1.18.1 Sustainable Development Contributions Activity Description

The project activity is contributing towards fulfilling 3 SDG goals:

SDG 12.5: The project uses animal manure and organic waste as feedstock to produce biogas. Thus, the project will achieve Target 12.5 of SDG 12 Ensure sustainable consumption and production patterns. This contributes to achieve one of India's stated sustainable development priorities "By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

SDG 8.5: The project is promoting local economic development and improving the level of people's life by proving potential job opportunities to the residents and it has provided 25, Long and short terms employment positions for local people.

SDG 13: The project uses CSTR to treat animal manure, collect and destroy the generated biogas to avoid methane emissions. This contributes to achieve India's stated sustainable development priorities.

1.18.2 Sustainable Development Contributions Activity Monitoring

The project, located in village Shahanshahpur of Varanasi district In Uttar Pradesh State of India, produces biogas by utilizing animal manure as feedstock, the project achieves significant GHG emission reductions. The project is owned and implemented by Gobardhan Varanasi Foundation SPV. The project also provides long and short-term job opportunities for local people and contributes to the economic prosperity

Table 1: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	12.5	12.5.1 National recycling rate, tons of material recycled	Recycling the produced waste	The project uses 70 tonnes of animal manure waste which is a waste material from nearby dairy farms and households. During the current monitoring period, 15,607 tonnes of animal manure have been processed.	From 16-June-2022 to 30-June-2023, the amount of animal manure waste treated by the project was 15,607 tonnes. This is the first monitoring period, therefore the current and contribution over the project lifetime is same
2)	8.5	8.5.1 Average hourly earnings of employees, by sex, age, occupation, and persons with disabilities	Implemented activities to increase	Provided 25 Long and short terms employment positions for local people. No further changes during the first monitoring period	Provided 25, Long and short terms for local people. No further changes during the first monitoring period
3)	13.2	13.2.2 Total greenhouse gas emissions per year	Implemented activities to increase	By treatment of solid waste, the project during the current monitoring period has avoided 2,806 tCO ₂ e.	From 16-June-2022 to 30-June-2023, the project has achieved a GHG emission reduction of 2,806 tCO ₂ e. This is the first monitoring period, therefore the current and contribution over the project lifetime is same

1.19 Additional Information Relevant to the Project

Leakage Management

Leakage emissions are considered as per the applicable methodologies.

Commercially Sensitive Information

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

Further Information

Not Applicable

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	The stakeholders of the project are identified as villagers around the project, officers of local government, and sector experts.
Legal or customary tenure/access rights	The project has been approved by local government and has no conflicting rights with stakeholders.
Stakeholder diversity and changes over time	The stakeholders included different gender, age, occupation and will change over time.
Expected changes in well-being	1. The project will supply job opportunities to local residents and increase their income. 2. The project will supply organic fertilizers to around farmland and increase their production
Location of stakeholders	Village Shahanshahpur of Varanasi district, Uttar Pradesh

Location of resources	Village Shahanshahpur of Varanasi district, Uttar Pradesh
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2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	10-August-2023
Stakeholder engagement process	The project owner held a stakeholder consulting meeting on 10-August-2023, invited local villagers, government officers and sector experts to investigate their opinions on the construction of this project. Since the local communities are the predominant stakeholders for the meeting, Hence the invitation letters were sent to Gram Pradhan & Govt officials on 24-July-2023. Furthermore, During LSC Meeting, Questionnaires were distributed to collect comments from local villages. The following questions were asked in the feedback by tick mark: • This project turns waste into useful product. • The project creates job to the local people. • The project do not harm to the environment. • This project reduce Methane and Carbon di Oxide emission to the atmosphere. • Due to this project income of local people has increased. • The project reduce dependency on diesel & petrol consumption in transport • The project contributes to the national clean mission. • The project helps in overall development of the society.
Consultation outcome	• All stakeholders interviewed are supportive to the implementation of the project, believing that the Project will help improve the community environment and promote local economic development. • All comments raised during local stakeholder consultation have been considered in the report and corresponding precaution measures and corrective actions (if any) have been proposed to ensure all issues

	during construction and operation of the project are properly addressed.
Ongoing communication	The project owner established the mechanism for on-going communication with local stakeholders. That is, a Grievance Register is prepared and kept at main gate of project site location, and any stakeholders can express their opinions and views on the project.
Stakeholder input	In general, local stakeholders are supportive of the project construction. The survey shows that a majority of local stakeholders think the Project will help improve the life of local people and promote local economic development without much adverse environmental impact. There is no suggestion about the project design

2.1.3 Free Prior and Informed Consent

Obtaining consent	The project has conducted construction project approval process, such as UPPCB Consent, PESO Approval & Other business license of the project has been approved by local government. The project activity does not affect any IPs, LCs, and customary rights holders. Therefore, there is no ongoing or unresolved conflicts in relation to the project activity
Outcome of FPIC	No consent is needed from the IPs, LCs and customary right holders as the project activity does not involve any encroachment of Indigenous Customary land rights. The project activity is constructed within the existing project boundary

2.1.4 Grievance Redress Procedure

Development process	The project proponent will hold stakeholder consulting meeting in each subsequent monitoring period and spread questionnaire to stakeholders to collect their opinion and suggestion. Besides, Grievance Register is prepared and kept at main gate of project site location, and any stakeholders can express their opinions and views on the project.
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Grievance redress procedure	The project proponent has appointed a staff member to record and collect conflicts and dissatisfaction from stakeholders. The project proponent will contact and discuss with the relevant stakeholders within 3 days. Based on the information collected by the relevant parties, the conflict shall be handled within 30 days.
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Grievances received	Resolution and outcome
No grievances received during the monitoring period	Not Applicable

2.1.5 Public Comments

Comments received	Actions taken
The project was listed for 30 days' period on VERRA Portal for Global Stakeholder comments. No comments received	Not Applicable

2.2 Risks to Stakeholders and the Environment

	Risks identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	Conduct briefing on the project activity to the involved stakeholder to inform on the project. All stakeholders have been informed during the stakeholder consultation meeting on the safety concern of the project activity.
Working conditions	No risk identified	Policy related to safety of working conditions was established. Emergency Plan and First Aid Management is available in the biogas plant
Safety of women and girls	No risk identified	Safety at workplace is highly emphasized. In the safety work procedure has stated that pregnant woman is not advisable to handle harmful reagents.

Safety of minority and marginalized groups, including children	No risk identified	Safety procedure for visitors including children to the biogas plant is also available and therefore safety issues is not a concern for visitors
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	It is expected that the by-product of the project activity shall not release any harmful pollutants that might degrade the environment

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	There are no discrimination or sexual harassment occurred or expected to occur in the project site.
Management experience	The PP has a proficient management team for the seamless operation of the project activity. The team consists of the members, having expertise in their relevant fields and who work closely with local communities and government <i>agencies</i> .
Gender equity in labor and work	There is no gender discrimination in terms of labor in this project activity. Equal job opportunities were provided to both genders
Human trafficking, forced labor, and child labor	Not applicable as the project activity does not involve any human trafficking, forced labor, and child labor in the operation.

2.3.2 Human Rights

Not Applicable as the project activity does not involve any rights of IPs, LCs, and customary rights holders.

2.3.3 Indigenous Peoples and Cultural Heritage

Not Applicable as the project activity does not involve any cultural heritage.

2.3.4 Property Rights

Rights to territories and resources	Not applicable as the Project does not involve any legal or customary tenure/access rights to territories, property, and resources, including collective and/or conflicting rights, held by stakeholders. The land for the Varanasi Smart City
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	Bio-Conversion Project is owned by Varanasi Municipal Corporation
Respect for property rights	Not applicable

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	Not applicable for the project, as the project does not impact any property rights
Summary of the benefit sharing plan	Not applicable for the project, as the project does not impact any property rights
Approval and dissemination of benefit sharing plan	Not applicable for the project, as the project does not impact any property rights
Benefit sharing during the monitoring period	Not applicable for the project, as the project does not impact any property rights

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure taken
Impacts on biodiversity and ecosystems	No risk identified	No formal impact envisaged on biodiversity due to the sitting of the Varanasi Smart City Bio-Conversion Project. The land Project is owned by Varanasi Municipal Corporation. No new areas were explored.
Soil degradation and soil erosion	No risk identified	No formal impact on the soil applicable is envisaged by the project
Water consumption and stress	No risk identified	The water consumption is reasonable and been approved. No water consumption and stress risk
Usage of fertilizers	No risk identified	The project will supply organic fertilizers freely and no such risk.

2.4.1 Rare, Threatened, and Endangered species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☐ Yes

☒ No

2.4.2 Introduction of species

Not Applicable, as the project doesn't involve planting or species introduction

2.4.3 Ecosystem conversion

Not Applicable, as the project is not ARR, ALM, WRC or ACoGS project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS-III.AO.	Methane recovery through controlled anaerobic digestion	1.0 ¹⁰
Methodology	AMS-III.D.	Methane recovery in animal manure management systems	21.0 ¹¹
TOOL	Tool 05	Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation	3.0 ¹²
TOOL	Tool 21	Demonstration of additionality of small-scale project activities	13.1 ¹³
TOOL	Tool 14	Project and leakage emissions from anaerobic digesters	2.0 ¹⁴
TOOL	Tool 07	Tool to calculate the emission factor for an electricity system	07.0 ¹⁵

¹⁰ https://cdm.unfccc.int/UserManagement/FileStorage/CDM_AMSU745LJQM81SDJJOJ2S4G7ID9EIKFGD

¹¹ <https://cdm.unfccc.int/UserManagement/FileStorage/1AWXEKHVTYF423LCN56Z9GIMQOS8JR>

¹² <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf>

¹³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.1.pdf>

¹⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf>

¹⁵ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

TOOL	Tool 06	Project emissions from flaring	04.0 ¹⁶
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3.2 Applicability of Methodology

Methodology ID	Applicability condition	Justification of compliance
AMS-III.AO.	Methane recovery through controlled anaerobic digestion	
AMS-III.AO.	This methodology comprises measures to avoid the emissions of methane to the atmosphere from biomass or other organic matter that would have otherwise been left to decay anaerobically in a solid waste disposal site (SWDS), or in an animal waste management system (AWMS), or in a wastewater treatment system (WWTS). In the project activity, controlled biological treatment of biomass or other organic matters is introduced through anaerobic digestion in closed reactors equipped with biogas recovery and combustion/flaring system. The following conditions apply: (a) Digestion of biomass or other matter(excluding animal manure and sludge generated in the wastewater treatment works) as a single source of substrate is included; (b) Co-digestion of multiple sources of biomass substrates, e.g. MSW, organic waste, animal manure, wastewater, where those organic matters would otherwise have been treated in an anaerobic treatment system without biogas recovery is also eligible; (c) If for one or more sources of substrates, it cannot be demonstrated that the organic matter	The proposed plant involves co-digestion of around 70TPD of Animal manure (Cow dung) & other feedstock such as Press-mud or Napier grass sourced from nearby farmers/dairy farms and sugar mills, that would have otherwise been left to decay anaerobically. (a) Not applicable: There are more than one substrate for digestion; (b) Applicable: The project involves co-digestion of animal manure and press mud/Napier grass. (c) Applicable: For feedstock (Press-mud or napier grass) in biodigester, PP is not able to demonstrate that the organic matter would otherwise been left to decay anaerobically, hence as per para 1 (c) of AMS IIIAO, baseline emissions related to such organic matter has been accounted as zero, the baseline emission has only been considered for utilization of animal manure (cow dung).

¹⁶ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

	would otherwise been left to decay anaerobically, baseline emissions related to such organic matter shall be accounted for as zero, whereas project emissions shall be calculated according to the procedures presented in this methodology for all co-digested substrates; (d) Project participants shall apply the procedures related to the “competing use for the biomass” according to the latest “General guidance on leakage in biomass project activities”; (e) Project activities treating animal manure as single source substrate shall apply AMS-III.D “Methane recovery in animal manure management systems”, similarly projects only treating wastewater and/or sludge generated in the wastewater treatment works shall apply AMS-III.H “Methane recovery in wastewater treatment”; (f) The project activity does not recover or combust landfill gas from the disposal site (unlike AMS-III.G “Landfill methane recovery”), and does not undertake controlled combustion of the waste that is not treated biologically in a first step (unlike AMS-III.E “Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment”). Project activities that recover biogas from wastewater treatment shall use methodology AMS-III.H.	(d) Not applicable: Cow manure and press mud will not lead to the competing use for the biomass. (e) Not applicable: The Project will treat more than one substrate, (f) Not applicable: The Project does not recover or combust landfill
AMS-III.AO.	Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO₂ equivalent annually.	The annual average emission reduction for the first crediting period is 4,741 tCO₂e which is less than 60 kt CO₂

AMS-III.AO.	The location and characteristics of the disposal site of the biomass used for digestion in the baseline condition shall be known, in such a way as to allow the estimation of its methane emissions. Guidelines in AMS-III.G, AMS-III.D, AMS-III.E (concerning stockpiles) and AMS-III.H (as the case may be) shall be followed in this regard. Project activities for co-digestion of animal manure shall also meet the requirements under paragraphs 1 and 2(c) of AMS-III.D. The following requirement shall be checked ex ante at the beginning of each crediting period: a) Establish that identified landfill(s)/stockpile(s) can be expected to accommodate the waste to be used for the project activity for the duration of the crediting period; or b) Establish that it is common practice in the region to dispose off the waste in solid waste disposal site (landfill/stockpile).	The project activity pertaining to the baseline scenarios applicable under this methodology considers Stockpiling of waste as the nature of the disposal sites. Thus, the following conditions are applicable to the project activity (which shall be established by PP during the validation process): a) The identified disposal site with stockpiling as the characteristics, can be expected to accommodate the waste to be used for the project activity projected for the entire crediting period. b) The common practice in the region for the particular types of waste is stockpiling into the solid waste disposal site.
AMS-III.AO.	The project participants shall clearly define the geographical boundary of the region referred to in 3(b), and document it in the CDM-PDD. In defining the geographical boundary of the region, project participants should take into account the source of waste, i.e. if waste is transported up to 50 km, the region may cover a radius of 50 km around the project activity. In addition, it should also consider the distances to which the final product after digestion will be transported. In either case, the region should cover a reasonable radius around the project activity that can be justified with reference to the project circumstances but in no case it shall be more than 200 km.	The distance from where the identified wastes shall be transported and the final product (i.e. CBG) shall be transported are less than 200km radius from the project location.

	Once defined, the boundary should not be changed during the crediting period(s).	
AMS-III.AO.	In case residual waste from the digestion is handled aerobically and submitted to soil application, the proper conditions and procedures (not resulting in methane emissions) for storage and transportation and soil application must be ensured.	The bio-residual is submitted for soil application. The proper conditions and procedures for storage and transportation and soil application include: the bio residual will be placed in the tank whose depth is less than 1m and immediately transported to land by trucks
AMS-III.AO.	In case residual waste from the digestion is treated thermally/mechanically, the provisions in AMS-III.E related to thermal/mechanical treatment shall be applied	Not applicable, as the bio-residual is submitted to soil application
AMS-III.AO.	In case residual waste from the digestion is stored under anaerobic conditions and/or delivered to a landfill, emissions from the residual waste shall to be taken into account and calculated as per the latest version of the Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site.	Not applicable, as the bio-residual is submitted to soil application
AMS-III.AO.	In case the outflow from the digestion is discharged to a subsequent wastewater treatment system or to the natural water receiving body, relevant procedure in AMS-III.H shall be followed to estimate the resultant project emissions.	The outflow from the digestion is discharged to a subsequent wastewater treatment system and further reused for various plant activities; thus, it is confirmed that it is not released to any natural water receiving body
AMS-III.AO.	Technical measures shall be used to ensure that all biogas captured from the digester is combusted/flared.	The recovered biogas in the Project will be upgraded and used as Bio CNG (Compressed biogas) for further use for transportation purposes. Additionally, an open flaring system is installed on the premises.

		The flaring system is designed to safely flare the generated biogas in case of less demand, excess biogas generated or unforeseen emergencies such as Bio-CNG plant breakdowns. This flare system is solely for emergency situation and not used under normal operation. Therefore, the project proponent ensures that all the biogas produced by the digester is primarily used for the Bio-CNG generation.
AMS-III.AO.	All the applications to utilize the recovered biogas detailed in paragraph 3 of AMS-III.H are eligible for use under this methodology. The relevant procedure in AMS-III.H shall be followed in this regard.	Not applicable, as project is not claiming emission reduction credits for biogas utilisation
AMS-III.D.	Methane recovery in animal manure management systems	
AMS-III.D.	This methodology covers project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane. It also covers treatment of manure collected from several farms in a centralized plant.	The project activity involves treatment of manure collected from several farms in a centralized plant. Thus, the project activity satisfies the condition of the methodology.
AMS-III.D.	This methodology is only applicable under the following conditions: (a) The livestock population in the farm is managed under confined conditions; (b) Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries), otherwise "AMS-III.H Methane recovery in wastewater treatment" shall be applied; (c) The annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5 °C;	a) Applicable: In the project activity, the livestock of all the farms that are covered under the project are managed under confined conditions i.e., they are raised in a barn, house or fenced. As such, this project activity qualifies as a Type III.D small-scale project activity. b) Not Applicable: In the project activity, the animal manure is co-digested along with other types of waste (as already prescribed under the applicability of AMS III.AO).

	(d) In the baseline scenario the retention time of manure waste in the anaerobic treatment system is greater than one month, and if anaerobic lagoons are used in the baseline, their depths are at least 1 m; (e) No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.	The process wastewater is treated in an ETP plant and further reused into the process. Thus, there is no discharge into any natural water bodies. c) Applicable: In the project activity is located in the Uttar Pradesh India and the baseline sites are also within the same state and region. This is one of the warmest regions in India with an average daily high temperature of 33 degrees centigrade. Thus, the annual average temperature of the baseline site where anaerobic manure treatment facility is located is approximately much higher than 5 °C. d) Applicable: This project activity satisfied both the conditions i.e. the anaerobic lagoon treatment system in the baseline scenario has a retention time greater than 1 month. And, these anaerobic lagoons have a depth of at least 1 m. As such, this project activity qualifies as a Type III.D small-scale project activity. e) Applicable: No methane recovery and destruction by flaring, combustion or gainful use take place in the baseline scenario
AMS-III.D.	The project activity shall satisfy the following conditions: (a) The residual waste from the animal manure management system shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of	a) Applicable: In the project activity, the manure is treated together with other waste as co-digestion and the residual waste from the entire process (i.e. in the form of bio-manure) is sent for soil applications.

	“AMS-III.AO Methane recovery through controlled anaerobic digestion”. In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured; (b) Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared; (c) The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	Whereas, the effluent of the process is treated properly in an ETP plant to recycle within the plant premises for reuse. Thus, this project activity qualifies as a Type III.D small-scale project activity b) Applicable: In the project activity, the technical measures considered in the design ensures that all the biogas produced by the digester is upgraded to produce compressed biogas (CBG) which is fully utilized for transportation purposes. In order to ensure no biogas is released under exigencies, an emergency flare system is installed at the project site. The project activity includes an open flaring system. The flaring system is designed to safely flare the generated biogas in case of less demand, excess biogas generated or unforeseen emergencies such as Bio-CNG plant breakdowns. This flare system is solely for emergency situation and not used under normal operation. Therefore, the project proponent ensures that all the biogas produced by the digester is primarily used for the Bio-CNG generation. The project proponent ensures that all the biogas produced by the digester is primarily used for the Bio-CNG generation . c) Applicable: In the project activity, the design ensures
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		that the storage time of the manure after removal from animal barns including transportation is less than 45 days. This can be verified from the actual process design and specification of the plant.
AMS-III.D.	Projects that recover methane from landfills shall use "AMS-III.G Landfill methane recovery" and projects for wastewater treatment shall use AMS-III.H. Projects for composting of animal manure shall use "AMS-III.F Avoidance of methane emissions through composting". Project activities involving co-digestion of animal manure and other organic matters shall use the methodology "AMS-III.AO Methane recovery through controlled anaerobic digestion".	In the project activity, methane is not recovered from landfills and hence AMSIII.G is not applicable. Similarly, the project does not consider for emission calculation against the wastewater treatment, hence AMSIII.H is not applied. Similarly, the project does not involve composting of animal manure, instead it is treated under co-digestion with other organic matters; hence AMS-III.F is not applicable instead AMS-III.AO has been applied (as already explained earlier)
AMS-III.D.	Utilization of the recovered biogas in one of the options detailed in AMS-III.H is also eligible under this methodology. The respective procedures in AMS-III.H shall be followed in this regard. If the recovered biogas is used to power auxiliary equipment of the project activity, it should be taken into account accordingly, using zero as its emission factor; however, energy used for such purposes is not eligible as an SSC CDM Type I project component.	In the project activity, the biogas is utilized for commercial use.
AMS-III.D.	New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General guidelines for SSC CDM methodologies".	Project activity is a new facility (greenfield project) and it does not involve in any capacity addition compared to the baseline scenario. Hence this condition so not applicable

AMS-III.D.	The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General guidelines for SSC CDM methodologies".	The project activity does not involve replacement of equipment and hence this condition is not applicable for the project activity.
AMS-III.D.	Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO ₂ equivalent annually from all Type III components of the project activity.	The annual average emission reduction for the first crediting period is 4,741 tCO ₂ e which is less than 60 kt CO ₂
Tool 05 Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation		
Tool 05	If emissions are calculated for electricity consumption, the tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption: (a) Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only, and either no captive power plant(s) is/are installed at the site of electricity consumption or, if any captive power plant exists on site, it is either not operating or it is not physically able to provide electricity to the electricity consumer; (b) Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumer and supply the consumer with electricity. The captive power plant(s) is/are not connected to the electricity grid; or (c) Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumer. The captive power	The project involves electricity consumption from the grid. Hence Scenario A is applicable

	plant(s) can provide electricity to the electricity consumer. The captive power plant(s) is/are also connected to the electricity grid. Hence, the electricity consumer can be provided with electricity from the captive power plant(s) and the grid.	
Tool 05	This tool can be referred to in methodologies to provide procedures to monitor amount of electricity generated in the project scenario, only if one out of the following three project scenarios applies to the recipient of the electricity generated: (a) Scenario I: Electricity is supplied to the grid; (b) Scenario II: Electricity is supplied to consumers/electricity consuming facilities; or (c) Scenario III: Electricity is supplied to the grid and consumers/electricity consuming facilities.	The project activity doesn't involve generation of electricity; hence this is not applicable
Tool 05	This tool is not applicable in cases where captive renewable power generation technologies are installed to provide electricity in the project activity, in the baseline scenario or to sources of leakage. The tool only accounts for CO2 emissions	No captive renewable power generation technologies are installed to provide electricity in the project activity; hence this is not applicable
Tool 21 Demonstration of additionality of small-scale project activities		
Tool 21	The use of the methodological tool "Demonstration of additionality of small-scale project activities" is not mandatory for project participants when proposing new methodologies. Project participants and coordinating/managing entities may propose alternative methods to demonstrate additionality for consideration by the Executive Board.	Project Doesn't propose a new methodology, hence this tool is applicable for the project

Tool 21	Project participants and coordinating/managing entities may also apply “TOOL19: Demonstration of additionality of microscale project activities” as applicable.	Project is not a microscale project activity; hence this tool is not applicable for the project
Tool 14 Project and leakage emissions from anaerobic digesters		
Tool 14	The following sources of project emissions are accounted for in this tool: (a) CO ₂ emissions from consumption of electricity associated with the operation of the anaerobic digester; (b) CO ₂ emissions from consumption of fossil fuels associated with the operation of the anaerobic digester; (c) CH ₄ emissions from the digester (emissions during maintenance of the digester, physical leaks through the roof and side walls, and release through safety valves due to excess pressure in the digester); and (d) CH ₄ emissions from flaring of biogas.	In the project scenario (a) The project involves electricity consumption from the grid; hence this is applicable. (b) The project doesn't involve consumption of fossil fuels; hence this is not applicable. (c) This is applicable, as project may involve leakage from digester, (d) The project doesn't involve flaring of gas, hence this is not applicable
Tool 14	The following sources of leakage emissions are accounted for in this tool: (a) CH ₄ and N ₂ O emission from composting of digestate; (b) CH ₄ emissions from the anaerobic decay of digestate disposed in a SWDS or subjected to anaerobic storage, such as in a stabilization pond.	In the project scenario (a) The project doesn't involve composting of digestate; hence this is not applicable. (b) The project doesn't involve anaerobic storage, such as in a stabilization pond; hence this is not applicable.
Tool 14	Emission sources associated with N ₂ O emissions from physical leakages from the digester, transportation of feed material and digestate or any other on-site transportation, piped distribution of the biogas, aerobic treatment of liquid digestate and land application of the digestate are neglected because these are minor emission sources or because they are accounted in the methodologies referring to this tool.	This is minor emission hence not considered in project case. Hence this is not applicable.

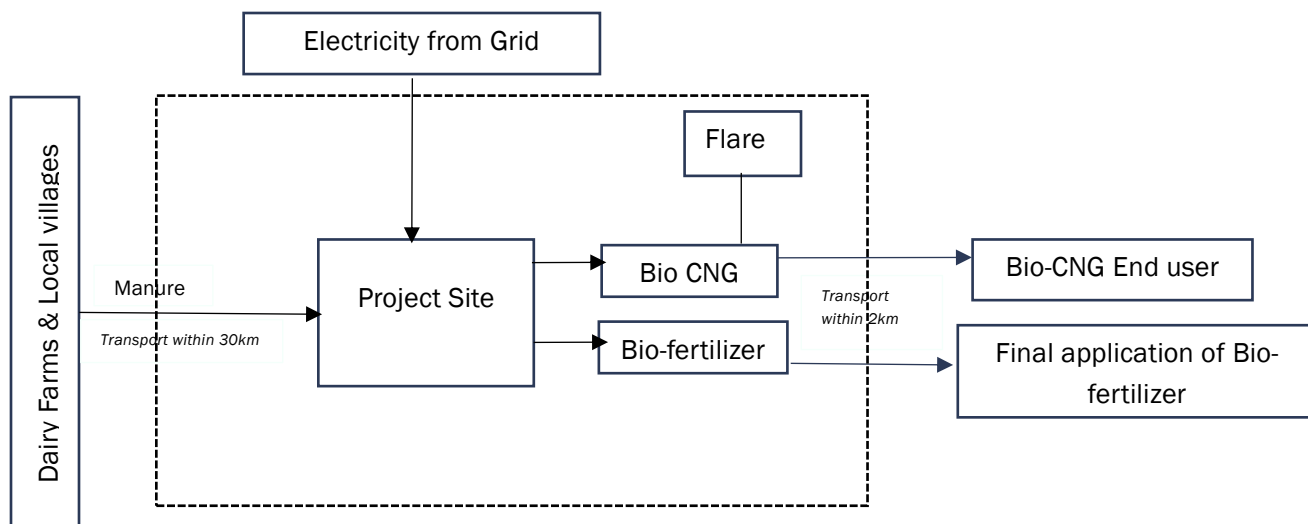
TOOL 06 Project emissions from flaring		
Tool 6	This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the VCS PDD the type of flare used in the project activity.	Applicable: The project activity includes an open flare. This project uses AMS III.AO. and within this methodology, the project emissions refer to this tool.
Tool 6	This tool is applicable to the flaring of flammable greenhouse gases where: (a) Methane is the component with the highest concentration in the flammable residual gas; and (b) The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g., biogas, landfill gas or wastewater treatment gas).	Applicable: Option b is applicable as the source of the residual gas is a biogenic source (biogas).
Tool 6	The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. In the case of an enclosed flare, there shall be operating specifications provided by the manufacturer of the flare and these shall be followed by the project participant.	Applicable: The project does not utilize auxiliary fuels. The residual gas (biogas) contains approximately 50% methane, providing ample flammable gas to sustain combustion. The flare is not an enclosed flare in the project.

3.3 Project Boundary

The Project is to recover the biogas from the anaerobic treatment process and use them as vehicle fuel displacing fuel CNG. As explained in Section 1.1., The proposed project is claiming emission reduction credits for methane avoidance only and utilisation of biogas in transport is not part of project boundary.

Hence, the project boundary includes the project plant, lands where bio-residual is submitted for soil application and the transportation of animal manure, and bio-residual as well as the transportation from the Biogas plant to filling station.

The table below provides an overview of the emissions sources included or excluded from the project boundary for determination of baseline and project emissions. Detailed SLD has also provided in Section 6.3 of JPD MR.



AMS III. AO, Version 1.0	Clause	Inclusion in Boundary
a	Where the solid waste (including animal manure, where applicable) would have been disposed and the methane emission occurs in absence of the proposed project activity;	The solid waste would have been disposed of in the identified solid waste disposal site. This is included in the project boundary. The project boundary covers the waste collection area of Varanasi district, Uttar Pradesh.
b	In the case of projects co digesting wastewater, where the wastewater would have been treated anaerobically in the absence of the project activity;	There is no co digesting of wastewater in the project activity. Hence, this is not included in the project boundary.
c	Where the treatment of biomass or other organic matters through anaerobic digestion takes place;	The project boundary includes an anaerobic digester where the treatment of organic matter through anaerobic digestion takes place.
d	Where the residual waste from biological treatment or products from those treatments, like slurry, are handled, disposed, submitted to soil application, or treated thermally/mechanically;	The dedicated drying yard for the residual waste from the digestion is included in the project boundary. The farmlands where the composted residual waste from the project plant is submitted to soil are not at

		the project site, but they are included in the project boundary.
e	Where biogas is burned/flared or gainfully used, including biogas sale points, if applicable;	The project site includes an open flaring system which is included in the boundary. The sale points are also included in the project boundary
f	And the itineraries between them (a, b, c, d and e), where the transportation of waste, wastewater, where applicable manure, residual waste after digestion, or biogas occurs.	The transportation route between a, c and d are included in the project boundary.

AMS III. D., Version 21.0	Clause	Inclusion in Boundary
The project boundary includes the physical, geographical site(s) of:		
a	The livestock	The geographical sites of the livestock used for animal manure generation are included in the project boundary
b	Animal manure management systems (including centralised manure treatment plant where applicable)	Animal manure management systems (including centralized manure treatment plant where applicable) have been included in the project boundary
c	Facilities which recover and flare/combust or use methane	The project site includes an open flaring system which is included in the boundary. The sale points are also included in the project boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Animal manure treatment process	CO ₂	No	Excluded for simplification. This is conservative.
		CH ₄	Yes	The major source of emissions in the baseline from uncovered anaerobic digester

Source		Gas	Included?	Justification/Explanation
		N ₂ O	No	Excluded for simplification. This is conservative.
Project	Emissions due to physical leakage of biogas	CO ₂	No	Excluded for simplification. This is conservative.
		CH ₄	Yes	The major source of emissions in the baseline from uncovered anaerobic digester
		N ₂ O	No	Not significant. Excluded for simplification
	Emissions from use of electricity	CO ₂	Yes	Electricity consumption for operation of the equipment of the project is taken into account.
		CH ₄	No.	Excluded for simplification. This is conservative.
		N ₂ O	No.	Excluded for simplification. This is conservative.
	Emissions from the transportation of the wastes from sources to the project site	CO ₂	Yes	Major Emission Source due to the combustion of diesel in the vehicles
		CH ₄	No.	Not significant. Excluded for simplification
		N ₂ O	No.	Not Applicable
	Emissions from flaring of Biogas	CO ₂	Yes	Biogas upon flaring will give CO ₂
		CH ₄	No.	Major Emission Source CH ₄ emissions due to the inefficiency of an open flare system (assumed to be 50% efficiency according to the tool applied)
		N ₂ O	No.	Not Applicable

3.4 Baseline Scenario

As explained in Section 1.1, The proposed plant involves co-digestion of around 70TPD of Animal manure (Cow dung) & other feedstock such as Press-mud or Napier grass sourced from nearby farmers/dairy farms and sugar mills. The proposed project is claiming emission reduction credits for methane avoidance only and utilisation of biogas in transport is not part of project boundary.

For feedstock (Press-mud or napier grass) in biodigester, PP is not able to demonstrated that the organic matter would otherwise been left to decay anaerobically, hence as per para 1 (c) of AMS IIIA0, baseline emissions related to such organic matter has been accounted as zero, the baseline emission has only been considered for utilization of animal manure (cow dung). Hence, baseline scenario is only applicable for Animal manure in the project.

Baseline scenario for animal manure

Para 17 of the applied methodology AMS-III.D (version 21), which states that “the baseline scenario is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere”.

As per CPCB Report “Guidelines for Environment Management of Dairy Farms and Gaushalas” dated Sep 2019¹⁷, The disposal of cow/buffalo dung is the biggest challenge in dairy farms and gaushalas. Many Gaushala and dairy farms discharge the cattle dung into the drains, leading to clogging. The dung produces many gases which are directly emitted to atmosphere without any methane recovery.

As per report of National Bank for Agriculture and Rural Development (NABARD) on Sectoral Paper on Animal Husbandry¹⁸, Methane (CH₄) emission occurs mainly from this sector due to livestock rearing (enteric fermentation and manure management). It is evident from the animal husbandry practices in India that GHG emissions (both CO₂ during combustion and CH₄ in anaerobic condition of stockpiling (SWDS) and dumping (Animal Waste Management System) occur at the stage of manure management.

In the pre-project scenario, the animal manure generated from the various livestock farms and gaushalas is being dumped in the nearby low-lying areas in an unscientific manner. The waste gets deposited in due course of time in layers and the bottommost layer is subject to heat and pressure in the absence of air. Thus, conditions leading to anaerobic decomposition occur in such cases without any methane recovery. The baseline scenario has also been clearly explained by the Letter from Varanasi Smart City Limited, Statement for Traditional Use of Cattle Dung.

In the pre-project scenario, animal manure generated from various livestock farms and gaushalas was improperly dumped in nearby areas in an unscientific manner. The collection of cow dung

¹⁷ <https://www.dpcc.delhigovt.nic.in/uploads/news/7d7567c34697a215ed3520f88972e71c.pdf>

¹⁸ <https://www.nabard.org/auth/writereaddata/file/AH%20Final.pdf>

would be done from nearby villages namely Shihorva, Jkkhani, Shahanshapur, Betawar and few more villages¹⁹.

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Over time, the waste accumulated in layers, with the bottommost layer experiencing heat and pressure in the absence of air. This led to anaerobic decomposition without methane recovery. This unscientific waste dung was used by farmers. The proposed project activity aims to replace the existing anaerobic system. It involves the scientific treatment of these wastes in a centralized plant with closed biodigesters under anaerobic conditions, including provisions for recovering methane generated from the process. The resulting Bio-CNG (purified methane) is then utilized in in transport and thermal applications.

Hence, in the absence of the project activity, the baseline scenario involves the untreated decay of municipal solid waste (MSW), press mud, and animal manure within the project boundary, resulting in methane emissions to the atmosphere.

The proposed project activity involves replacement of existing anaerobic system where these wastes would be treated scientifically in a centralized plant in closed biodigesters in anaerobic conditions with a provision to recover methane generated from the process. The Biogas (purified methane) is then utilized in transport applications.

Hence, the baseline scenario of the project is the animal manure waste was left to decay in anaerobic manure management system (lagoon) at the livestock farms and methane is emitted to the atmosphere directly without any methane recovery and destruction facility.

3.5 Additionality

As explained in Section 3.2 and 3.4, since project is not claiming emission reduction credits for press-mud waste (via AMS IIIA0) and Bio CNG use in transport (AMS III AQ), hence demonstration of additionality for the project is justified via use of AMS IIID, applicable for methane emission avoidance via treatment of animal manure

As per para. 15-16 of AMS-III.D (Version 21.0), project activities may demonstrate the additionality by showing that there is no regulation in the host country, applicable to the project site, that requires the collection and destruction of methane from livestock manure. If so, it is not required to apply the “Guidelines on the demonstration of additionality of small-scale project activities”. This additionality condition also applies to Greenfield project activities.

In this regard, it should be noted that there no regulations in the country that is applicable to the project site, that requires the collection and destruction of methane from animal manure. Details of relevant regulation and their non applicability is provided below

¹⁹ Complete list of villages are provided in Letter from Varanasi Smart City Limited, Statement for Traditional Use of Cattle Dung, provided to VVB

- The relevant national laws and regulations pertaining to generation of energy in India are: Solid waste management Rules, 2016²⁰. However, the generation of Biogas from waste is not a legal requirement or a mandatory option. There are state and sectoral policies framed primarily to encourage waste management projects. These policies have also been developed in order to recognize the magnitude of the risks involved in the projects and to attract private investment. The current practice in India is the disposal of solid waste without any treatment or processing. Hence the rules are systematically not enforced and the non-compliance with the recommendation is widespread in the country.
- Project is also implemented under GOI's Sustainable Alternative Towards Affordable Transportation "SATAT" scheme. The SATAT Scheme (Sustainable Alternative Towards Affordable Transportation)²¹ is an initiative by the government of India with the objective of setting up Compressed Biogas production plants. The Scheme was launched in October 2018 by the Ministry of Petroleum and Natural Gas in collaboration with several oil related public sector units like Bharat Petroleum Corporation and Hindustan Petroleum Corporation. 'SATAT' scheme on Compressed Bio Gas (CBG) encourages entrepreneurs to set up CBG plants, produce & supply CBG to Oil Marketing Companies (OMCs) for sale as automotive & industrial fuels. As explained above, SATAT is an initiative by Government of India to Encourage entrepreneurs to set up CBG plants and is not mandatory guidelines/Regulation to implement the project by private entities. Hence, CBG project implemented by Gobardhan Varanasi Foundation SPV is voluntary initiative and is not implemented in compliance with any regulatory requirement.

Hence, as explained above, CBG project implemented by Gobardhan Varanasi Foundation SPV is voluntary initiative and is not implemented in compliance with any regulatory requirement. Also, as the project is a green-field project activity. Hence, project is not required to demonstrate additionality. Hence, in line with AMS-III.D (Version 21.0), **the project is deemed automatically additional.**

3.5.1 Regulatory Surplus

Is the project registered or seeking registration in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country

☒ **Non-Annex 1 country**

Are the project activities mandated by any law, statute, or other regulatory framework?

☐ Yes

☒ **No**

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

²⁰ https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf

²¹ <https://satat.co.in/satat/#/>

☐ Yes

☒ No

3.5.2 Additionality Methods

Already covered in Section 3.5 of the VCS PD MR

3.6 Methodology Deviations

No methodology deviation is applied in the project.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

Project activity is implemented on 16-June-2022 which is the commissioning date of this project activity. There are no such incidents in the current monitoring period that may impact the GHG emission reductions or removals and monitoring. Project activity is methane recovery and utilization project located in village Shahanshahpur of Varanasi district In Uttar Pradesh State of India.

Also, there is no any other changes in the project activity.

Also, during this monitoring period, no events has occurred which may impact the GHG emission reductions or removals and monitoring.

5 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per para 12, AMS-III.AO (Version 1.0), The baseline emissions are calculated as:

$$BE_y = BE_{SWDS,y} + BE_{ww,y} + BE_{manure,y} - MD_{reg,y} * GWP_{CH_4}$$

$BE_{SWDS,y}$ Yearly methane generation potential of the solid waste anaerobically digested by the project activity

$BE_{manure,y}$ Where applicable, baseline emissions from the manure co-digested by the project activities, calculated as per the relevant procedures of AMS-III.D

$BE_{ww,y}$ Where applicable, baseline emissions from the wastewater co-digested, calculated as per the procedures of AMS-III.H

$MD_{reg,y}$ Amount of methane that would have to be captured and combusted in the year y to comply with the prevailing regulations (tonne)

GWP_{CH_4} GWP for CH₄ (value of 28 is used)

Where:

Since, the project doesn't involve waste water co-digestion & There is no biogas that would have to be captured and combusted to comply with the prevailing regulations in the baseline scenario.

Hence $BE_{ww,y}$ and $MD_{reg,y}$ are 0.

Furthermore, as explained in Section 3.2 and 3.4, For feedstock (Press-mud or naiper grass) in biodigester, PP is not able to demonstrated that the organic matter would otherwise been left to decay anaerobically, hence as per para 1 (c) of AMS IIIA0, baseline emissions related to such organic matter has been accounted as zero. Hence $BE_{swds,y} = 0$.

Therefore, the formula used to calculate baseline emissions is simplified to be:

$$BE_{bio,y} = BE_{manure,y}$$

Baseline Emissions due to Manure ($BE_{manure,y}$)

Baseline emissions from the manure co-digested in the project activity is calculated as per the relevant procedures of AMS-III.D, Ver 21.0.

For estimation of baseline emission option in paragraph 17(b) is chosen, baseline emissions are estimated using the amount of manure that would decay anaerobically in the absence of the project activity based on direct measurement of the quantity of manure treated together with its specific volatile solids (SVS) content. The baseline emissions are determined as follow

$$BE_{manure,y} = GWP_{CH_4} \times D_{CH_4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y}$$

Where:

$Q_{manure,j,LT,y}$ = Quantity of manure treated from livestock type LT and animal manure management system j (tonnes/year, dry basis)

$SVS_{j,LT,y}$ = Specific volatile solids content of animal manure from livestock (tonnes/tonnes, dry basis)

MCF_j = Annual methane conversion factor (MCF) for the baseline animal manure management system

$B_{0,LT}$ = Maximum methane producing potential of the volatile solid generated for animal type LT (m³ CH₄/kg-dm)

- D_{CH_4} = CH4 density (0.00067 t/m³ at room temperature (20 °C) and 1 atm pressure)
 GWP_{CH_4} = Global Warming Potential (GWP) of CH4
 UF_b = Model correction factor to account for model uncertainties (0.94)

The default values used for the purpose are listed below:

Parameter	Details	Value	Source
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system	0.8	IPCC default value, Volume 4, Chapter10, Table 10.17 METHANE CONVERSION FACTORS FOR MANURE MANAGEMENT SYSTEMS, Page 68 ²²
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type (cow) (m ³ CH4/kg-dm)	0.13	
D_{CH_4}	CH4 density (0.00067 t/m ³ at room temperature (20 °C) and 1 atm pressure)	0.00067	AMS-III.D, Ver 21.0
GWP_{CH_4}	Global Warming Potential (GWP) of CH4	28	IPCC Fifth Assessment Report, Table 8.A.1
UF_b	Model correction factor to account for model uncertainties	0.94	AMS-III.D, Ver 21.0
SVS	Specific volatile solids content of animal manure from livestock (tonnes/tonnes, dry basis)	0.7856	Site Records (Lab Report)

Bases on above default parameters, the equation would be

$$BE_{\text{manure},y} = (28 \times 0.00067 \times 0.94 \times 0.71 \times 0.13 \times Q_{\text{manure},j,LT,y}) \times 0.52 \times 10^3$$

$$BE_{\text{manure},y} = (0.000846381 \times Q_{\text{manure},j,LT,y}) \times 10^3$$

In the project scenario,

²² https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch10_Livestock.pdf

Baseline Case	TPD	Soruce
Cow Dung (TPD)	70	Page 23, Feasibility Report August 2020
No of Days	300	
Quantity of manure treated (TPA), Dry Basis	21,000	Calculated
Moisture content on Manure	80.62%	Site Records (Lab Report)
$Q_{manure,j,LT,y}$ Quantity of manure treated (TPA), Wet Basis	4069.8	Quantity of manure (dry basis) = quantity of manure (wet basis) $\times$ (1-water content of manure (wet basis))
$BE_{manure,y}$	5,863 (Round down value)	Calculated

5.2 Project Emissions

As per Para 13 of **AMS III AO (Ver 01)**, Project activity emissions consist of:

- CO₂ emissions due to incremental transportation distances;
- CO₂ emissions from electricity and/or fossil fuel consumption by the project activity facilities;
- In case the residual waste from the digestion is stored under anaerobic conditions and/or delivered to a SWDS, or treated in a WWTS: the methane emissions from the disposal/storage/treatment of these residual waste;
- Methane emissions from physical leakages of the anaerobic digester;
- Methane emissions due to flare inefficiency;

$$PE_y = \left\{ \begin{array}{l} PE_{transp,y} + PE_{power,y} + PE_{res\ waste,y} \\ + PE_{phy\ leakage,y} + PE_{flaring,y} \end{array} \right\}$$

Where:

PE_y	Project activity emissions in the year y (tCO ₂ e)
$PE_{transp,y}$	Emissions from incremental transportation in the year y (tCO ₂ e)
$PE_{power,y}$	Emissions from electricity or fossil fuel consumption in the year y (tCO ₂ e)
$PE_{res\ waste,y}$	In case residual wastes are subjected to anaerobic storage, or disposed in a landfill: methane emissions from storage/disposal/treatment of waste (tCO ₂ e)
$PE_{phy\ leakage,y}$	Methane emissions from physical leakages of the anaerobic digester in year y (tCO ₂ e)
$PE_{flaring,y}$	Methane emissions due to incomplete flaring in year y as per the “Tool to determine project emissions from flaring gases containing methane” (tCO ₂ e)

In the project case,

		Value	Reason
$PE_{res\ waste,y}$	In case residual wastes are subjected to anaerobic storage, or disposed in a landfill: methane emissions from storage/disposal/treatment of waste (tCO ₂ e)	0	As the residual wastes from the biogas plant is not handed anaerobically, these residues are utilized as bio-manure for soil application

Therefore, the formula used to calculate baseline emissions is simplified to be:

$$PE_y = PE_{phyleakage,y} + PE_{power,y} + PE_{transp,y} + PE_{flaring,y}$$

Methane emissions from physical leakages of the anaerobic digester ($PE_{phyleakage,y}$)

As per para 17 of AMS-IIIAO (Ver 01), Methane emissions due to physical leakages from the digester and recovery system shall be estimated using a default factor of 0.05 m³ biogas leaked/m³ biogas produced. Hence it's for simplification & as a conservative approach, this is calculated as 0.05 times the $BE_{manure,y}$.

$$PE_{phyleakage,y} = 0.05 * BE_{manure,y}$$

Hence, for the project case

$$PE_{phyleakage,y} = 0.05 * 20,027$$

$$PE_{phyleakage,y} = 1,001 \text{ tCO}_2\text{e}$$

Emissions from electricity or fossil fuel consumption ($PE_{power,y}$)

As no fossil fuel is consumed in the project activity, hence only Emission for electricity use is considered. According to "Tool to calculate baseline, project and/ or leakage emissions from electricity consumptions" (Version01)

$$PE_{power,y} = EC_y \times (1 + TDLY) \times EF_{grid,CM,y}$$

Where,

EC_y	:	Electricity consumption of the project facility in the year y (MWh).
$TDLY$	:	Average technical transmission and distribution losses for providing electricity in year y, (20%)
$EF_{grid,CM,y}$	:	Emission coefficient of the grid (combined margin emission factor of NEWNE Grid of India in the year y (tCO ₂ e/MWh)

Emission coefficient of the grid ($EF_{grid,CM,y}$)

The combined margin of the electricity grid is sourced from” CO2 Baseline database for the Indian Power Sector “Version 19.0 dated Nov 2023 of Central Electricity Authority of India²³ which follows Tool to calculate the emission factor for an electricity system”. The baseline emission factor ($EF_{grid,CM,y}$) is calculated as a combined margin (CM), consisting of the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors according to the following steps. Calculation for this combined margin is based on data from an official source publicly available.

The combined margin of the Indian grid used for the project activity is as follows:

Parameter	Value (tCO ₂ /MWh)	Nomenclature	Sources
EF _{grid,CM,y}	0.9124	Combined margin CO2 emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.5) & build margin (0.5) values, sourced from Baseline CO2 Emission Database, Version 19.0 dated Nov 2023 published by Central Electricity Authority (CEA), Government of India
EF _{grid,OM,y}	0.9580	Operating margin CO2 emission factor for the project electricity system in year y	Calculated as the last 3-year (2020-21, 2021-22, & 2022-23) generation-weighted average, sourced from Baseline CO2 Emission Database, Version 19.0 dated Nov 2023 published by Central Electricity Authority (CEA), Government of India
EF _{grid,BM,y}	0.8670	Build margin CO2 emission factor for the project electricity system in year y	Baseline CO2 Emission Database, Version 19.0 dated Nov 2023 published by Central Electricity Authority (CEA), Government of India

Hence, $EF_{grid,CM,y} = 0.9124 \text{ tCO}_2\text{e/MWh}$

Hence, Emissions from electricity consumption is estimated as

Emissions from electricity or fossil fuel consumption ($PE_{power,y}$)

$$PE_{power,y} = EC_y \times (1 + 20\%) \times 0.9124$$

In the project scenario,

		Source
Electricity Consumed (KWh per Day)	2400	Page 23, Feasibility Report August 2020
No of Days	300	
EC_y Annual electricity consumed by the project (MWh)	720	Calculated

²³ <https://cea.nic.in/cdm-co2-baseline-database/?lang=en>

$PE_{power,y}$	788	Calculated
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Emissions from incremental transportation ($PE_{transp,y}$)

The project emissions from incremental transportation by the project activity facilities as follows:

$$PE_{transp,y} = (Q_y / CT_y) * DAF_w * EF_{CO2,transport} + (Q_{res-waste,y} / CT_{res-waste,y}) * DAF_{res-waste} * EF_{CO2,transport}$$

Where,

Q _y	:	Quantity of raw waste/manure treated and/or wastewater co-digested in the year y (tonnes)
CT _y	:	Average truck capacity for transportation (tonnes/truck)
DAF _w	:	Average incremental distance for raw solid waste/manure and/or wastewater transportation (km/truck)
EF _{CO2 transport}		CO2 emission factor from fuel use due to transportation (kgCO2/km, IPCC default values or local values may be used)
Q _{res waste y}		Quantity of residual waste produced in year y (tonnes)
CT _{res waste y}		Average truck capacity for residual waste transportation (tonnes/truck)
DAF _{res waste}		Average distance for residual waste transportation (km/truck)

In the project scenario, only project emission for transport of manure to site is considered, In the baseline scenario, press mud produced in sugar mills were used in different industrial applications, hence its consumption in Gobardhan plant does not result in any incremental transport, hence not considered for estimation of project emission project emission for transport of press mud to site is not considered.

Project emission for transport of manure to site		Source
Quantity of raw waste/manure treated (Q _y)	21000	Tonnes
Quantity of residual waste produced ²⁴ (Q _{res waste y})	4069.81	Tonnes
Average truck capacity for transportation (tonnes/truck) (CT _y / CT _{res waste y})	12	The normal capacity is 18T but however considering the empty haulage it is projected as 12 t/truck which is conservative and fixed for the crediting period.
Average incremental distance for raw solid waste/manure (km/truck) (DAF _w)	30	Average distance travelled by truck to carry manure varies from 2 to 30km, However, Average distance of 30km is considered, which is conservative and fixed for the crediting period.
Average incremental distance for residual waste (km/truck) (DAF _{res waste})	5	Average distance travelled by truck to carry residual waste varies from 100m

²⁴ Quantity of residual waste is conservatively considered as equal to Quantity of manure (Dry Basis) treated in the Gobardhan plant. Waste generated is distributed to nearby farmer at no cost, hence no monitoring of same is undertaken. However, for the purpose of PE estimation, it considered as equal to total manure (Dry Basis) treated in plant

		to 5km, However, Average distance of 30km is considered, which is conservative and fixed for the crediting period.
CO ₂ emission factor from fuel use due to transportation (kgCO ₂ /km) (EF _{CO₂ transport})	0.7375	India specific Emission factors for Transport, India GHG program, https://shaktifoundation.in/wp-content/uploads/2017/06/WRI-2015-India-Specific-Road-Transport-Emission-Factors.pdf
PE_{transp y}	40	Calculated

Hence, PE_{transp y} = 40 tCO₂e

Methane emissions due to flaring (PE_{flaring,y})

As per TOOL06, Project emissions from flaring (version 04.0) para 39,

$$PE_{flare,y} = GWP_{CH_4} \times \sum_{m=1}^{525600} F_{CH_4, RG, m} \times (1 - \eta_{flare, m}) \times 10^{-3}$$

Where,

PE _{flare,y}	:	Project emissions from flaring of the residual gas in year y (tCO ₂ e)
GWP _{CH₄}	:	Global warming potential of methane valid for the commitment period (tCO ₂ e/tCH ₄)
F _{CH₄,RG,m}	:	Mass flow of methane in the residual gas in the minute m (kg)
η _{flare m}	:	Flare efficiency in the minute

In the project scenario,

		Source
Global warming potential of methane (GWP _{CH₄})	28	Default Value
Flare efficiency in the minute (η _{flare m})	50%	Default value from section 6.2.1 of CDM Methodological tool TOOL06, V 04.0 for an open flare
Mass flow of methane in the residual gas	0	Considered zero, however same shall be monitored during the verification period
PE_{flare,y}	0	Calculated

Now, as per Para 13 of **AMS III D (Ver 01)**, Project activity emissions consist of:

- Physical leakage of biogas in the manure management systems which includes production, collection and transport of biogas to the point of flaring/combustion or gainful use (PE_{PL,y});
- Emissions from flaring or combustion of the gas stream (PE_{flare,y});
- CO₂ emissions from use of fossil fuels or electricity for the operation of all the installed facilities (PE_{power,y});

- CO₂ emissions from incremental transportation distances;
- Emissions from the storage of manure before being fed into the anaerobic digester ($PE_{storage,y}$).

$$PE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$$

Where:

- PE_y = Project emissions in year y (t CO₂e)
- $PE_{PL,y}$ = Emissions due to physical leakage of biogas in year y (t CO₂e)
- $PE_{flare,y}$ = Emissions from flaring or combustion of the biogas stream in the year y (t CO₂e)
- $PE_{power,y}$ = Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year y (t CO₂e)
- $PE_{transp,y}$ = Emissions from incremental transportation in the year y (t CO₂e), as per relevant paragraph in AMS-III.AO
- $PE_{storage,y}$ = Emissions from the storage of manure (t CO₂e)

Now,

$PE_{PL,y}$	Emissions due to physical leakage of biogas in year	Not applicable , as its already covered in Project emission for AMS IIIAO
$PE_{flare,y}$	Emissions from flaring or combustion of the biogas stream in the year	
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year	
$PE_{transp,y}$	Emissions from incremental transportation in the year , as per relevant paragraph in AMS-III.AO	
$PE_{storage,y}$	Emissions from the storage of manure	Considered 0 , As a) The storage time of the manure after removal from the animal barns, including transportation, is less than 24 hours before being fed into the anaerobic digester; b) (b) The dry matter content of the manure when removed from the animal barns is more than 20%.

Hence, project emission from the project activity shall be:

$$PE_y = PE_{phyleakage,y} + PE_{power,y} + PE_{transp,y} + PE_{flaring,y}$$

		Value	unit
$PE_{phyleakage,y}$	Methane emissions from physical leakages of the anaerobic digester	293	t CO ₂ e/year
$PE_{power,y}$	Emissions from electricity or fossil fuel consumption	788	t CO ₂ e/year

PE _{transp,y}	Emissions from incremental transportation in the year	40	t CO ₂ e/year
PE _{flaring,y}	Methane emissions due to flaring	0	t CO ₂ e/year
Project Emission		1,121	tCO₂/year

5.3 Leakage Emissions

Leakage from project activity is described below

Meth	Applicability	Remarks
AMS III AO	As per Para 18. If the project technology is the equipment transferred from another activity or if the existing equipment is transferred to another activity, leakage effects are to be considered (LE _y)	The equipment(s) for the Project activity are not transferred from another facility and the existing equipment will not be transferred to another activity, thus leakage effects are not considered as per the applied methodology
AMS IIID	As per Para 26. It is determined by following the relevant procedure in the methodological tool "Project and leakage emissions from anaerobic digesters". Now, as per para 25 of Tool 14 (Project and leakage emissions from anaerobic digesters), The leakage emissions associated with the anaerobic digester (LEAD _y) depend on how the digestate is managed. They include emissions associated with storage and composting of the digestate.	Since, the project doesn't involve any storage and composting of the digestate, hence leakage effects are not considered as per the applied methodology

Therefore, LE_y=0

5.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Emission reductions are calculated as follows:

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
16-Jun-2022 to 31-December-2022	3,197	608	0	2,588

01-January-2023 to 31-December-2023	5,863	1,121	0	4,741
01-January-2024 to 31-December-2024	5,863	1,121	0	4,741
01-January-2025 to 31-December-2025	5,863	1,121	0	4,741
01-January-2026 to 31-December-2026	5,863	1,121	0	4,741
01-January-2027 to 31-December-2027	5,863	1,121	0	4,741
01-January-2028 to 31-December-2028	5,863	1,121	0	4,741
01-January-2028 to 15-June-2028	2,666	513	0	2,153
Total estimated ERs	41,041	7,850	0	33,187

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	D _{CH₄}
Data unit	m ³ CH ₄ / m ³ CH ₄
Description	Density of methane at normal conditions
Source of data	CDM Tool 14, version 02.0
Value applied:	0.00067
Justification of choice of data or description of measurement methods and procedures applied	Data considered from the tool 'Thermophysical properties of fluids. II. Methane, Ethane, Propane, Isobutane and Normal Butane' by B.A. Younglove, J.F. Ely

Purpose of Data	Calculation of project emissions
Comments	-

Data / Parameter	GWP_{CH4}
Data unit	tCO ₂ e/t _{CH4}
Description	Global Warming Potential for CH ₄
Source of data	IPCC Fifth Assessment Report, Chapter 8, Table 8. A.1 ²⁵ (page 731)
Value applied:	28
Justification of choice of data or description of measurement methods and procedures applied	Global warming potential of methane valid for the relevant commitment period.
Purpose of Data	Used in Calculation of baseline emissions & project emissions
Comments	-

Data / Parameter	MCF_j
Data unit	%
Description	Methane correction factor for cow manure in baseline situation
Source of data	IPCC default value, Volume 4, Chapter10, Table 10.17 METHANE CONVERSION FACTORS FOR MANURE MANAGEMENT SYSTEMS, Page 68
Value applied:	0.80

²⁵ https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf

Justification of choice of data or description of measurement methods and procedures applied	IPCC default value has been considered for the calculations.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	UF_b
Data unit	Fraction
Description	Model correction factor to account for model uncertainties
Source of data	IPCC default value, Volume 4, Chapter 10, Table 10.A-4
Value applied:	0.94
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value has been considered for the calculations.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$B_{0,LT}$
Data unit	$m^3CH_4/kg\text{-}dm$
Description	Maximum methane production potential of the volatile solid generated for the animal type (Cow)
Source of data	IPCC 2006 Guidelines, table 10.A-4, chapter 10, volume 4.
Value applied:	0.13
Justification of choice of data or description of	IPCC default value.

measurement methods and procedures applied	
Purpose of Data	Calculation of baseline emissions.
Comments	-

Data / Parameter	TDL _y
Data unit	%
Description	Average technical transmission and distribution losses for providing electricity in year y
Source of data	The default value in 'Tool to calculate baseline, project and or leakage emissions from electricity consumption' (Version 01)
Value applied:	20
Justification of choice of data or description of measurement methods and procedures applied	Default Value
Purpose of Data	For the calculation of the Project Emission
Comments	-

Data / Parameter	EF _{grid, OM, ,y}
Data unit	tCO ₂ /MWh
Description	Operating margin CO ₂ emission factor for Indian National grid
Source of data	Baseline CO ₂ Emission Database, Version 19.0, Nov 2023 published by Central Electricity Authority (CEA), Government of India
Value applied:	0.9580

Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor is a 3-year generation weighted average data, based on the most recent data available on CEA database. Data compiled in CEA CO ₂ CDM database is in line with the requirements Version 04.0.0 of “Tool to calculate the emission factor for an electricity system”.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid, BM, y}
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of grid
Source of data	Baseline CO ₂ Emission Database, Version 19.0, Nov 2023 published by Central Electricity Authority (CEA), Government of India
Value applied:	0.8670
Justification of choice of data or description of measurement methods and procedures applied	The build margin emission factor is the most recent data available from CEA CO ₂ Baseline database. Data compiled in CEA CO ₂ CDM database is in line with the requirements Version 04.0.0 of “Tool to calculate the emission factor for an electricity system”
Purpose of Data	Calculation of baseline emissions
Comments	The build Margin is calculated ex ante and fixed for the entire crediting period.

Data / Parameter	EF _{CO₂, transport}
Data unit	Kg CO ₂ /km
Description	CO ₂ emission factor from fuel use due to transportation

Source of data	India specific Emission factors for Transport, India GHG program, https://shaktifoundation.in/wp-content/uploads/2017/06/WRI-2015-India-Specific-Road-Transport-Emission-Factors.pdf
Value applied:	0.7375
Justification of choice of data or description of measurement methods and procedures applied	Emission factor for freight Vehicles more than 12 tonnes (Heavy Vehicle)
Purpose of Data	Calculation of project emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$\eta_{flare,m}$
Data unit	%
Description	The fraction of methane destroyed from flaring. The flare efficiency depends on the combustion efficiency of the flare
Source of data	Default value from section 6.2.1 of CDM Methodological tool TOOL06, V 04.0 for an open flare
Value applied:	50%
Justification of choice of data or description of measurement methods and procedures applied	The value of the flare efficiency used for the emission reduction calculations are as per the section 6.2.1 of CDM Methodological tool TOOL06, V 04.0 for an open flare
Purpose of Data	Calculation of project emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	DAFw
Data unit	km/truck

Description	Average incremental distance for raw solid waste/manure transportation
Source of data	Survey & plant records
Value applied:	30
Justification of choice of data or description of measurement methods and procedures applied	Average distance travelled by truck to carry manure varies from 2 to 30km, However, Average distance of 30km is considered, which is conservative and fixed for the crediting period.
Purpose of Data	Calculation of project emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$DAF_{res-waste,y}$
Data unit	km/truck
Description	Average incremental distance for residual waste transportation
Source of data	Survey & plant records
Value applied:	5
Justification of choice of data or description of measurement methods and procedures applied	Average distance travelled by truck to carry residual waste varies from 100m to 5km, However, Average distance of 30km is considered, which is conservative and fixed for the crediting period.
Purpose of Data	Calculation of project emissions
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid, CM, y}$
Data unit	tCO ₂ /MWh

Description	Combined margin CO ₂ emission factor for grid
Source of data	Calculated
Value applied:	0.9124
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ The following default values should be used for W_{OM} and W_{BM}: For Wind power generation project activities: $W_{OM} = 0.5$ and $W_{BM} = 0.5$ for the selected crediting period Data compiled in CEA CO₂ CDM database is in line with the requirements Version 04.0.0 of "Tool to calculate the emission factor for an electricity system"
Purpose of Data	Calculation of baseline emissions
Comments	The Combined Margin is calculated ex ante and fixed for the crediting period.

6.2 Data and Parameters Monitored

Data / Parameter	$Q_{manure,j,LT,y}$	
Data unit	T/year	
Description	Quantity of manure (Cow dung) Dry Basis treated in baseline digester in year y	
Source of data	Weighbridge	
Description of measurement methods and procedures applied	Quantity of cow manure treated is measured using electronic weighbridge regularly and records are kept on paper and electronically	
Frequency of monitoring/recording	Continuous with annual aggregation	
Value applied:	21,000	
Monitoring equipment	Weighbridge	
	Type	Electronic Weighbridge

	Capacity	60 MT
	Make	Leotronic Scale
	Calibration Date	09-12-2021 09-12-2022
	Calibration Frequency	Annual
QA/QC procedures applied	Regular weighing of waste by project proponent will be carried out in a weighbridge according to Monitoring plan. The weigh bridge would be calibrated annually	
Purpose of data	Calculation of baseline emissions	
Calculation method	The parameter is measured and if any calculation is required, the calculation is based on measured parameters. Quantity of manure (dry basis) = quantity of manure (wet basis) × (1-water content of manure²⁶)	
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.	

Data / Parameter	$SVS_{j,LT,y}$
Data unit	Kg VS/kg-dm
Description	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y
Source of data	Lab Report, which is measured as per the guideline in annex 2 of AM0073 ²⁷
Description of measurement methods and procedures applied	Method for determination of Volatile Solids in animal waste From: USDA. Agricultural Waste Management Field Handbook. Chapter 4 - Agricultural Waste Characteristics. Page 2. <u>Definitions</u> Total Solids: Residue remaining after water is removed from waste material by evaporation; dry matter;

²⁶ Moisture content in manure is estimated as 80.62% (Site Records (Lab Report))

²⁷ https://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_8CTM5MFZLTD07SZK1A6D7AK3YPIG7S

	• Volatile Solids: The part of total solids driven off as volatile (combustible) gases when heated to 600° C; organic matter; • Fixed Solids: The part of total solids remaining after volatile gases driven off at 600° C; ashes. <u>Determination method</u> 1. Evaporate free water on steam able and dry in oven at 103° C for 24 hours or until constant weight to obtain the Total Solids. 2. Place Total Solids residue in furnace at 600° C for at least 1 hour. Volatile Solids are determined from weight difference of total and Fixed Solids. Volatile matter (dry basis) = $\frac{W2 - Wf}{W2 - W1}$ Where W1 is the weight of sample container, W2 is combined weight of the sample container and oven dried sample, Wf is the combined constant weight of the sample container and sample after heating at 600° C
Frequency of monitoring/recording	Annually
Value applied:	73.75 % ²⁸
Monitoring equipment	Electric scales
QA/QC procedures applied	-
Purpose of data	Calculation of baseline emissions and project emissions
Calculation method	Method for determination of Volatile Solids in animal waste from: USDA. Agricultural Waste Management Field Handbook. Chapter 4 - Agricultural Waste Characteristics. Page 2
Comments	Sampling details: The samples will be taken annually. Each sample from the gaushalas will be taken and if it is collected from the local livestock farms, samples will be collected, mixed with 30 randomly selected farmers and sent for testing. A conservative value will be taken for the ER calculations.
Data / Parameter	FoP

²⁸ (Site Records (Lab Report))

Data unit	hours
Description	Operating hours of Flare
Source of data	Plant records/logbook
Description of measurement methods and procedures applied	The values will be obtained from Logbook data maintained by the plant personnel based on the hour's meters in the flaring unit.
Frequency of monitoring/recording	Data to be aggregated monthly.
Value applied:	0
Monitoring equipment	Plant Records
QA/QC procedures applied	As per manufacturer's specifications. A flare detector has been applied to determine flare operation time as required by the Tool 06 "Project emissions from flaring" version 6
Purpose of data	Calculation of project emissions
Calculation method	The parameter is measured and if any calculation is required, the calculation is based on measured parameters
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

Data / Parameter	$BG_{burnt,y}$
Data unit	m ³
Description	Biogas volume produced in the anaerobic digester in year y
Source of data	Plant records/logbook
Description of measurement methods and procedures applied	The amount of Biogas produced in year y. The values will be obtained from Logbook data maintained by the plant personnel. A flow meter will be used to measure the quantity of the Biogas produced in the anaerobic digester. Methane content in the biogas would be measured using Biogas analyzer. The fraction of

	methane in the biogas would be measured with a continuous analyzer (values are recorded with the same frequency as the flow).
Frequency of monitoring/recording	Data to be aggregated monthly.
Value applied:	825,000 ²⁹
Monitoring equipment	Flow meters
QA/QC procedures applied	As per manufacturer's specifications and calibrated once in three years.
Purpose of data	For the calculation of the project emissions
Calculation method	The parameter is measured and if any calculation is required, the calculation is based on measured parameters.
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

Data / Parameter	EC _{PJJ,y}
Data unit	MWh
Description	Amount of electricity consumed from the grid as a result of the project activity
Source of data	Electricity meter reading from electricity meter bill by the State Electricity Board or any Private Supplier
Description of measurement methods and procedures applied	Data is measured and recorded continuously through meters and meter readings are archived electronically. The data will be calculated by monitoring the difference between the reading in meter at the end of the month and beginning of the month. This parameter will be updated ex-post each year over the crediting period.
Frequency of monitoring/recording	Monthly

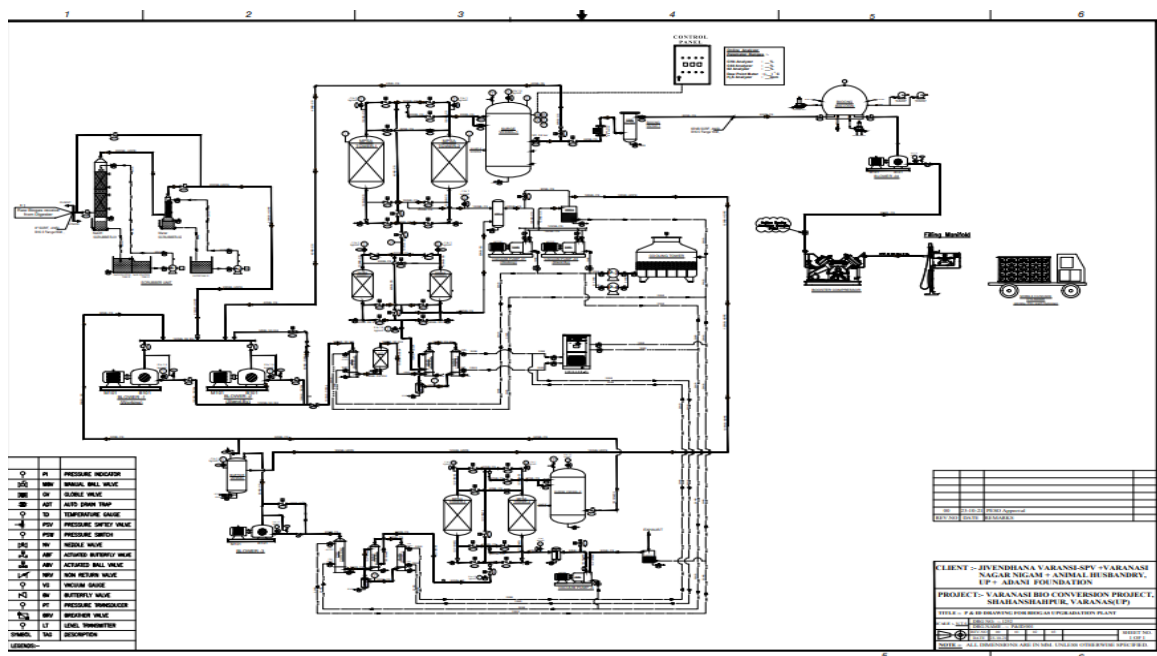
²⁹ Project is expected to produce 2500m³ of biogas per day, hence annual biogas is estimated s 2500 * 330 = 825,000m³

Value applied:	720
Monitoring equipment	Electricity meter (Electricity Board Energy Meter)
QA/QC procedures applied	As the meters will be maintained by third party agency the accuracy of data is ensured. The meters are entirely under the control of State Electricity Board/DISCOM. The metering system will be calibrated according to CEA regulations which specifies Electricity meters to be calibrated once in 5 years. Calibration frequency: One in five years
Purpose of data	Calculation of Project emissions
Calculation method	The parameter is measured and if any calculation is required, the calculation is based on measured parameters
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

Data / Parameter	$Q_{res} \cdot waste, y$
Data unit	T/year
Description	Quantity of residual waste produced in year y
Source of data	Plant records, weighbridge
Description of measurement methods and procedures applied	Quantity of waste is measured using electronic weighbridge regularly and records are kept on paper and electronically.
Frequency of monitoring/recording	Data to be aggregated monthly.
Value applied:	5,250
Monitoring equipment	Plant Records
QA/QC procedures applied	Regular weighing of waste by project proponent will be carried out in a weighbridge according to monitoring plan. The weigh bridge would be calibrated annually

6.3 Monitoring Plan

Plant SLD



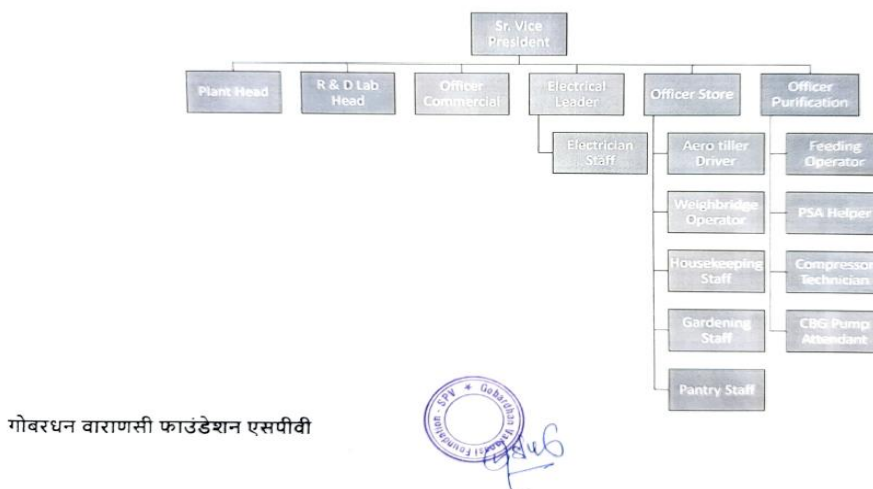
Operational and Management Structure

- **Site manager:** Engineer responsible for recording of the monitored parameters and the defined frequency
- **Site engineer:** Responsible for the data collection (monitoring) from various departments and compilation.

- **SCADA operator:** Monitoring all equipment and process variables (flow rate, biogas content, temperature, pressure, etc.) on SCADA System. Keeping electronic records extracted from Scada and archives them

Organisational chart

Organization Chart of GVF-SPV Team :



Monitoring Equipment and Data

The data sets relating to the monitoring parameters outlined in section 6.2. above will be monitored and stored for the project. Monitoring equipment and data for the project are as below:

Monitoring Parameter	Monitoring Equipment	Description
$Q_{manure,j,LT,y}$ (Quantity of manure (Cow dung) treated in baseline digester)	Weighbridge	The quantity of manure on wet basis and other relevant details are recorded by the weighbridge operator and reported to the site engineer. Daily recordings are aggregated monthly and recorded. The weighbridge is calibrated in line with the India regulations. Please refer to Section 6.2 in VCS PD.
$EC_{PJ,j,y}$ (Amount of electricity consumed from the grid as a result of the project activity)	Electricity meter	Electricity meter could continuously measure the electricity imported from Indian national grid ($EC_{PJ,j,y}$) and consumed by the project. The data will be recorded monthly by the project proponent. The electricity invoice or receipt could be used as back up data source and be cross checked by verifier during Verification.
$SVS_{LT,y}$ - Specific volatile solids content of animal manure from livestock type LT and	Laboratory test Report	Lab Report, which is measured as per the guideline in annex 2 of AM0073

animal manure management system j in year y		
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Quality Assurance and Quality Control (QA/QC) procedures

For staffs involved in the project, necessary trainings will be provided by the project owner. The training contents should be regard to the general and technical aspects of the project to the extent appropriate, as well as basic understandings of VCS Standard and climate change.

All the monitoring devices used (including flow meters, weight measurer and electricity meter) will be calibrated periodically according to relevant national standards and regulations.

Flow meters, electricity meter and other critical project monitoring equipment will be subject to regular maintenance and testing according to technical specifications from the manufactures to ensure accuracy and good performance. The calibration of meters, including the frequency of calibration, will be done in accordance with national standards or requirements. The accuracy class of the meters will be in accordance with the stipulation of the meter supplier and/or as per the requirements set by the grid operators or national requirements.

The calibration reports will be kept in the archives by the project proponent and be kept at least for 2 years after the end of last the crediting period.

Internal auditing

Project owner will conduct the internal auditing by cross checking the data from the invoices and data logbooks for ensuring the quality and consistency of data measured and monitored for the purpose of emission reduction calculations.

Data Management

Site engineer will be specifically responsible for meter calibration, training, checking the daily operation, data recording and archiving. All data collected will be recorded and regularly backed up. Internal audit will be carried out to check compliance with operational procedures outlined in this monitoring plan. This internal audit will also identify potential possible adjustments for operational procedures to improve monitoring and reporting in future years.

The Site engineer will report monthly to the Site Manager about the project performance and monitored data. In the event that non-conformance in the performance to the mentioned procedures and/or functioning problems of the monitoring equipment are identified, the Site engineer will inform the Site Manager about the situation and work out relevant measures to be taken.

In case such nonconformities are observed: - An analysis of the nonconformity and its causes will be carried out immediately by the project owner, with the help of external experts if necessary. - A corrective action plan should then be developed to eliminate the non-conformity and its causes to prevent its recurrence. - Corrective actions are implemented and reported back to the Site engineer. - Relative information will be included in the monitoring report and reported to VVB during the verification.

The Site engineer from the project will be appointed by the project proponent to take the overall responsibility for monitoring greenhouse gas emission reductions and keeping all monitored data collected as part of monitoring archived electronically and be kept at least for 2 years after the end of last the crediting period. Electronic data and documents will be regularly copied and archived and kept at least two years after the end of the crediting period. Written data and documents, including electricity invoices or receipts for cross-checking, will be copied and archived and kept at least two years after the end of the crediting period.

Procedure in case of failure

If during the data collection, one data exceeds the permissible range, or if an abnormal situation is detected, the Site engineer would analyze the reason of the error as soon as possible and take action. The relevant errors and solutions should be archived and stored.

Once a flow meter is found faulty, it shall be immediately repaired or replaced with another calibrated meter by a professional engineer.

If the data record is missing or damaged during the monitoring periods, the following makeup process will be conducted:

- The general principle is that Conservative value will be used for the missing or damaged data. This is most conservative approach. The monitoring personnel will be trained before the starting of the project operation to ensure that each team member is fully aware of and able to strictly follow this conservative principle.
- During the monitoring process, the monitoring personnel will be required to strictly abide by the above conservative principle in data recording, i.e., use Conservative value for all the missing or damaged data.
- If this is due to the working error of the monitoring personnel, further train the person until he or she can perform the job properly. And in the meantime, use Conservative value for the missing or damaged data;
- If this is due to the inability or attitude of a particular worker in monitoring team, dismiss such worker and re-hire those with proper ability and attitude. And in the meantime, use Conservative value for the missing or damaged data;
- If some data recorded are significantly higher than the normal range, the monitoring personnel should ask for the reason.
- If the measurement is high due to the damage of measurement equipment, Conservative value will be used for that day's data. And need to calibrate and maintain the measuring equipment immediately and avoid this situation in the future.
- If the monitoring results are satisfactory in terms of correct reporting, data completeness and correct analysis, the data will be accepted for the monitoring report

Emergency Preparedness

Site Manager ensures that the project personnel acquire the skills to carry out emergency tasks properly through capacity building practices and trainings. The whole staff receives health and safety trainings to minimize exposure to workplace hazards. At every shift, at least one trained technical personnel are present. All relevant information such as data files, maintenance, defect records and other monitoring related records are kept at a designated location in a transparent and organized manner. In case of emergency situation, the responsible staff shall immediately report to site manager to take any action necessary.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$Q_{manure,j,LT,y}$																																													
Data unit	T/year																																													
Description	Quantity of manure (Cow dung) treated in baseline digester in year y																																													
Value applied:	<table><tr><th>Months</th><th>Manure Consumed (tones)</th><th>Qty of Cow Dung (In Ton, wet basis)</th><th>Qty of Cow Dung (In Ton, dry basis)</th><th>Source</th></tr><tr><td>Jun-22</td><td>367</td><td rowspan="7">5,133</td><td rowspan="7">995</td><td rowspan="15">Cow dung purchase Invoices</td></tr><tr><td>Jul-22</td><td>320</td></tr><tr><td>Aug-22</td><td>1383</td></tr><tr><td>Sep-22</td><td>323</td></tr><tr><td>Oct-22</td><td>219</td></tr><tr><td>Nov-22</td><td>900</td></tr><tr><td>Dec-22</td><td>1621</td></tr><tr><td>Jan-23</td><td>1349</td><td rowspan="6">10,474</td><td rowspan="6">2,030</td></tr><tr><td>Feb-23</td><td>1181</td></tr><tr><td>Mar-23</td><td>1836</td></tr><tr><td>Apr-23</td><td>2273</td></tr><tr><td>May-23</td><td>2071</td></tr><tr><td>Jun-23</td><td>1764</td></tr><tr><td>Total</td><td>15607</td><td></td><td></td><td></td></tr></table>					Months	Manure Consumed (tones)	Qty of Cow Dung (In Ton, wet basis)	Qty of Cow Dung (In Ton, dry basis)	Source	Jun-22	367	5,133	995	Cow dung purchase Invoices	Jul-22	320	Aug-22	1383	Sep-22	323	Oct-22	219	Nov-22	900	Dec-22	1621	Jan-23	1349	10,474	2,030	Feb-23	1181	Mar-23	1836	Apr-23	2273	May-23	2071	Jun-23	1764	Total	15607			
Months	Manure Consumed (tones)	Qty of Cow Dung (In Ton, wet basis)	Qty of Cow Dung (In Ton, dry basis)	Source																																										
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Apr-23	2273																																													
May-23	2071																																													
Jun-23	1764																																													
Total	15607																																													
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.																																													

Data / Parameter	$SVS_{j,LT,y}$
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Data unit	Kg VS/kg-dm
Description	Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y
Value applied:	0.7856
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

Data / Parameter	FoP
Data unit	Hours
Description	Description Operating hours of Flare
Value applied:	0
Comments	No flaring of biogas has been conducted during the monitoring period from (16-June -2022 to 30-June-2023), hence methane emission from flaring (PE_{Flare}) has been considered as zero. Respective declaration has been provided to VVB

Data / Parameter	$BG_{burnt,y}$
Data unit	m ³
Description	Biogas volume produced in the anaerobic digester in year y
Value applied:	0 ³⁰
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

Data / Parameter	$Q_{res} \cdot waste,y$
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³⁰ As per PP declaration, No flaring of biogas has been conducted during the monitoring period from (16-June -2022 to 30-June-2023), hence methane emission from flaring (PE Flare) has been considered as zero

Data unit	T/year			
Description	Quantity of residual waste produced in year y			
Value applied:	Year	Qty of Cow Dung (In Ton, wet basis)	Qty of Cow Dung (In Ton, dry basis)	Qty of residual waste generated
	2022	5,133	995	995
	2023	10,474	2,030	2,030
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.			

Data / Parameter	EC _y			
Data unit	MWh			
Description	Amount of electricity consumed from the grid as a result of the project activity			
Value applied:	Months	Unit Consumed (KVAh)	Vintage (KVAh)	Source
	Jun-22	10680	218183	Monthly Electricity Bills
	Jul-22	32025		
	Aug-22	25178		
	Sep-22	20445		
	Oct-22	11843		
	Nov-22	50213		
	Dec-22	67800		
	Jan-23	144323	727330	
	Feb-23	97973		
	Mar-23	151553		
	Apr-23	141003		
May-23	120413			
Jun-23	72068			
Total (Kvah)	945513			
Total Units (KWh)	850961.25			
Total Units (MWh)	851			
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.			

7.2 Baseline Emissions

As explained in Section 5.1, The equation for baseline emissions is:

$$BE_{manure,y} = GWP_{CH_4} \times D_{CH_4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times Q_{manure,j,LT,y} \times SVS_{j,LT,y}$$

Using the default and monitored values, The total baseline emissions achieved in current monitoring period is

Parameter	16-June -2022 to 31-December-2022	01-January-2023 to 30-June-2023	Total MP (16-June -2022 to 30-June-2023)
Quantity of manure treated (Tonnes) (Dry Basis)	5,133	10,474	15,607
Quantity of manure treated (Tonnes) Wet Basis)	995	2,030	3,025
Baseline Emissions due to Manure (tCO ₂ e)	1,272	2,595	3,938
Baseline Emission for MR Period (tCO₂e)			3,938

7.3 Project Emissions

As explained in Section 5.2, The equation for Project emissions is:

$$PE_y = PE_{phyleakage,y} + PE_{power,y} + PE_{transp,y} + PE_{flaring,y}$$

Using the default and monitored values, The total project reduction achieved in current monitoring period is

Parameter	16-June -2022 to 31-December-2022	01-January-2023 to 30-June-2023	Total MP (16-June -2022 to 30-June-2023)
Methane emissions from physical leakages of the anaerobic digester (PE_{phyleakage,y})	63.60	129.77	193.38
Emissions from electricity consumption (PE_{power,y})			
Electricity Consumed (MWh)	196	655	851
Emissions from electricity consumption (PE_{power,y})	215	717	932
Methane emissions due to flaring (PE_{flaring,y})³¹	0	0	0
Emissions from incremental transportation (PE_{transp,y})			
Quantity of manure treated (Wet Basis)	1283	2618	3,901.7

³¹ No flaring of biogas has been conducted during the monitoring period from (16-June -2022 to 30-June-2023), hence methane emission from flaring (PE_{Flare}) has been considered as zero. Respective declaration has been provided to VVB

1. Emissions from incremental transportation (Manure Collection)	2.37	4.83	7.2
Quantity of Residual Waste produced	1283	2618	3,901.7
2. Emissions from incremental transportation (Residual waste)	0.39	0.80	1.2
$PE_{trans,y} =$	2.76	5.63	8.4
Project Emission (16-June-2022 to 30-June-2023)	280.74	850.84	1,131.58
Project Emission for MR Period (tCO ₂ e)			1,132 (Roundup Value)

7.4 Leakage Emissions

As explained in Section 5.3, $LE_y=0$

7.5 GHG Emission Reductions and Carbon Dioxide Removals

The total emission reduction achieved in current monitoring period is

Vintage period	Baseline emissions (tCO ₂ e)	Project emissions (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Reduction VCUs (tCO ₂ e)	Removal VCUs (tCO ₂ e)	Total VCUs (tCO ₂ e)
16-June - 2022 to 31-December-2022	1,272.05	280.74	0	0	0	991
01-January-2023 to 30-June-2023	2,595.46	850.84	0	0	0	1,745
Total	3,938.40	1,131.58	0	0	0	2,806

The estimated ex-ante GHG emission reductions and removals and the achieved emission reductions and removals for this monitoring period are as below

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
16-June - 2022 to 30-June-2023	4,936	2,806	-43.15%	The ER generated during the current monitoring period is less than the estimated values, which is conservative

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

Not Applicable

APPENDIX 2: LSC MINUTES OF MEETING



Minutes of Meeting

STAKEHOLDERS CONSULTATION MEETING

VCS Project : Varanasi Smart City Bio-Conversion Project

Organizer : Gobardhan Varanasi Foundation-SPV

Project Location : Shahanshahpur Village, Varanasi district, Uttar Pradesh

Meeting Location : Gobardhan Varanasi Foundation-SPV, Training Room, Shahanshahpur Village, Varanasi district, Uttar Pradesh

Date : 10-08-2023

Time : 11:30 am

- Attendees list** : (list attached)
- Discussion** :
 - The commencement of the meeting was initiated by representatives from Varanasi Smart City Ltd , who extended a warm welcome to the local stakeholders . The central focus of the discussion revolved around comprehensive insights into the Gobardhan Bio CNG plant project and its notable contributions to the realms of environment, society, and economics.
 - On behalf of Gobardhan Varanasi Foundation SPV , Mr. Vikramaditya extending his greetings to the assembled stakeholders. Subsequently, he embarked on elucidating the establishment of the Gobardhan Bio CNG plant, accentuating its multifaceted socio-economic advantages, in tandem with the pivotal environmental benefits it offers. Stakeholders were briefed on the environmental benefits of a bio-CNG plant. The discussion covered waste-to-bio-CNG advantages . Environment benefits includes Reduced methane emissions from waste, cleaner-burning bio-CNG lowers carbon footprint and enhanced waste management and air quality , social aspects include job creation and economic growth and Healthier living environments for communities. Economic benefits are renewable energy source, reducing fossil fuel dependency. Revenue generation and cost savings from waste diversion.

Gobardhan Varanasi Foundation - SPV

Plant Office- Kanha Unvan Gaurdhala Village- Shahanshahpur, Arahmura-Kusaha road Varanasi - 221305 Uttar Pradesh, INDIA



- Following Mr. Vikramaditya's introductory discourse, the operational framework of the plant was expounded upon by Mr. Vikas Singh. He provided a comprehensive explanation of the plant's working model, detailing the intricate processes involved in the production and distribution of the product. Furthermore, Mr. Singh underscored the merits of opting for organic fertilizers in contrast to chemical fertilizers. He accentuated the substantial advantages derived from this environmentally sustainable approach, emphasizing the positive impact it has on ecological well-being and agricultural practices.
- The platform was also designated for stakeholders to pose their inquiries and concerns. Mr. Vikramaditya, along with the relevant subject matter experts, responded to these queries, ensuring that all aspects were thoroughly addressed and clarified.
- Overall, the meeting served as a platform for the dissemination of crucial information regarding the Gobardhan Bio CNG plant project, highlighting its commendable contributions to the environment, society, and the economic landscape.

3. Adjournment:

At 1:30 PM, the meeting was formally adjourned, with the organizers expressing their gratitude to the stakeholders for their active and valuable participation throughout the proceedings.



Gobardhan Varanasi Foundation - SPV

Plant Office: Kankh, Unwan, Gorakhpur, Uttar Pradesh, India. Phone: 0522-2222222. Email: info@vafoundation.org

