PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Bio-CNG Project in Sangli

Version 1.0

Date 16/12/2021

First CoU Issuance Period: 1 year, 11 months

Date: 20/01/2020 to 30/11/2021

Project Concept Note (PCN)
CARBON OFFSET UNIT (CoU) PROJECT

BASIC INFORMATION	
Title of the project activity	Bio-CNG Project in Sangli
Scale of the project activity	Small Scale
Completion date of the PCN	16/12/21
Project participants	Urja Bio System Pvt. Ltd., Pune, Maharashtra, India
Host Party	India
Sectoral scopes	13 Waste handling and disposal 07 Transport
Applied Methodology	**AMS-III.AQ.:** ***Introduction of Bio-CNG in transportation applications, Version 2.0*** ***AMS-III.D: Methane recovery in animal manure management systems, Version 21.0***
Estimated amount of GHG emission reductions	32912 CoUs (32912 tCO_{2eq})

SECTION A. Description of project activity

A.1. Purpose and general description of Carbon offset Unit (CoU) project activity >>

The project activity, **Bio-CNG Project in Sangli** is located in State: Maharashtra, Country: India

The details of the registered project are as follows:

Purpose of the project activity:
The **Bio-CNG Project in Sangli** comprises of a project activity using biogas technology for capturing methane from fresh poultry litter that is fed into an anaerobic digester and the gainful use of recovered methane gas for Bio-CNG bottling purposes for use in the transport sector. The project was commissioned on 20/01/2020.

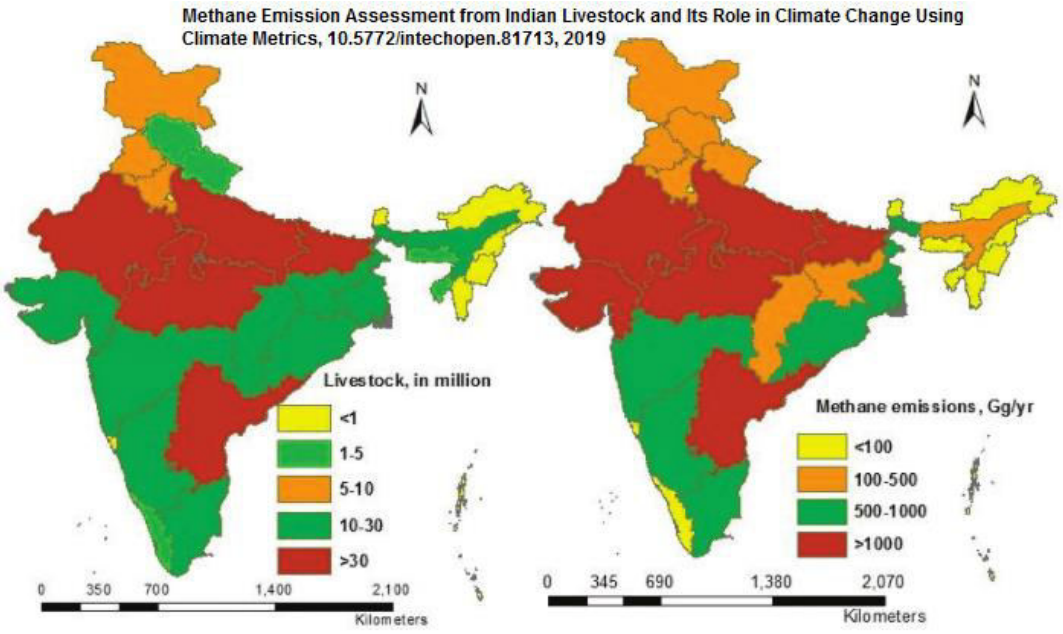
The project activity by VRK Nutritional Solutions Pvt Ltd (VRK) is located in Village: Arag, District: Sangli, State: Maharashtra, Country: India.

The purpose of the VRK project activity is the setup of an independent biogas plant of 2500 m^3 capacity to treat fresh poultry litter, from the poultry farm with 7,50,000 poultry birds within the project boundary, which generates and captures methane due to anaerobic digestion. The project activity comprises of measures taken to avoid the emissions of methane to the atmosphere from 30 tonnes per day (TPD) of poultry litter that would have otherwise been left to decay anaerobically within the project boundary. The project activities also involves the installation and operation of a Bio-CNG plant that includes processing, purification and compression of the recovered biogas to obtain up-graded biogas such that methane content, its quality and the physical and chemical properties are equivalent to the fossil CNG it replaces in vehicles. The project activities hence invlove the gainful use of the recovered methane for replacement of fossil CNG in vehicles.

A vehicle's emission with the enriched biogas fuel (Bio-CNG) meets to the BS IV emission norms. There is no significant change in fuel economy of the vehicle fuelled with the enriched biogas (24.11 km/kg) as compared to base CNG (24.38 km/kg). The biogas plant such as the project activity, are significant and growing contributors to achieve world climate-neutrality by 2050.

The project activity covers approved carbon reduction project activities involving the replacement or modification of anaerobic animal manure management systems in livestock farms to achieve methane recovery and gainful use of the recovered methane to generate Bio CNG to be used in the transport sector.

Worldwide, agricultural operations are becoming progressively more intensive to realize economies of production and scale. The pressure to become more efficient drives significant operational similarities between farms of a "type," as inputs, outputs, practices, genetics, and technology have become similar around the world. This is especially true in livestock operations (poultry, dairy cows, etc.) which can create profound environmental consequences, such as greenhouse gas emissions, odour, and water/land contamination (including seepage, runoff, and over application), that result from storing (and disposing of) animal waste.



India has the some of the world's largest livestock population at 500 million heads. Methane has a warming potential 21 times higher than carbon dioxide. Better livestock management can reduce atmospheric methane levels. Livestock emissions worldwide – from manure and gastroenteric releases – account for roughly 32 per cent of human-caused methane emissions. Methane has accounted for roughly 30 per cent of global warming since pre-industrial times and is proliferating faster than at any other time since record keeping began in the 1980s. In fact, according to data from the United States National Oceanic and Atmospheric Administration, even as carbon dioxideemissions decelerated during the pandemic-related lockdowns of 2020, atmospheric methane shot up.

Waste Type	Quantity
Poultry Litter	30 TPD (7,50,000 Poultry Head)

The poultry owners in the project activity can be classified as small to medium-level farmers who are feeding a combination of green fodder and crop residues. Feed intake is typically measured in terms of gross energy (eg., megajoules (MJ) per day) or dry matter (eg. kilograms (kg) per day).

The Indian poultry industry requierd sustainable waste solutions to the problem posed in disposing waste from poultry farms. Traditional disposal of poultry waste results in air, soil and water pollution and subsequently health hazards in human as well as in poultry. The poultry litter attracts flies that spread disease in nearby villages, often forcing the district administration to intervene and prevents the setup of such farms in the vicinity of residential neighbourhoods. Poultry farmers usually rake the droppings into a heap and let them dry in the sun or compost it. There are few takers for the manure. However, such biogas treatment of poultry litter is a sustainable solution that helps keep the surrounding environment clean and eliminates the issue with odour from poultry litter.

There is no regulation in India, applicable to the project activity, that requires the collection and destruction of methane from livestock manure or poultry litter. In the absence of the project activity, poultry litter manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. The project activity recovers and utilizes biogas for Bio CNG bottling purposes and hence displaces fuel using fossil fuels (CNG). The project activity hence avoids CH_4 and CO_2 emissions and is beneficial to the environment and community.

A.2 Do no harm or Impact test of the project activity>>

There are social, environmental, economic and technological benefits which contribute to sustainable development.

- **Social benefits:**
- Reduces outdoor air pollution, thus eliminating health hazards for people in the vicinity.
- The project provides security of energy supply since it generates biogas CNG
- It leads to better waste management thus keeping the surroundings clean and reduce some of the disease causing pathogens
- Biogas allows poultry farms to become self-sufficient and monetise their waste.
- It leads to better waste management thus keeping the surroundings clean and reduce some of the disease causing pathogens
- The battery cages & mechanical transportation of poultry litter to digester solves the issue of bad smell/odour, and fly issue besides very healthier conditions in poultry farming leading to good productivity and cleanliness in the farm.

- **Environmental benefits:**
- Biogas plants not only produce energy, but also digestate, which is formed during the process of Anaerobic Digestion (AD). Digestate is a perfect biological and green fertilizer that can reduce the use of mineral fertilizers, avoiding the emissions related to their energy-intensive production.
- Avoids local environmental pollution through better waste management
- Leads to soil improvement by providing high quality manure
- Avoided global and local environmental pollution and environmental degradation by switching from fossil fuels to renewable energy, leading to reduction of GHG emissions
- Reduces air pollution, and increases use of manure rather than chemical fertilizers.
- Using biogas as an energy resource contributes to clean environment.
- Hygienic conditions are improved through reduction of pathogens by utilizing the animal and other organic wastes in the bio-digesters.
- Curbs methane emission as well as any leachate that would otherwise have been generated from the current practice of unscientific waste disposal.
- Further, by generating Bio-CNG through utilising the biogas, the project helps in replacing fossil fuel intensive fuels for transport.
- Recycling of the biogas slurry ensures that water is recycled into the biomethanation process thus resulting in water savings.

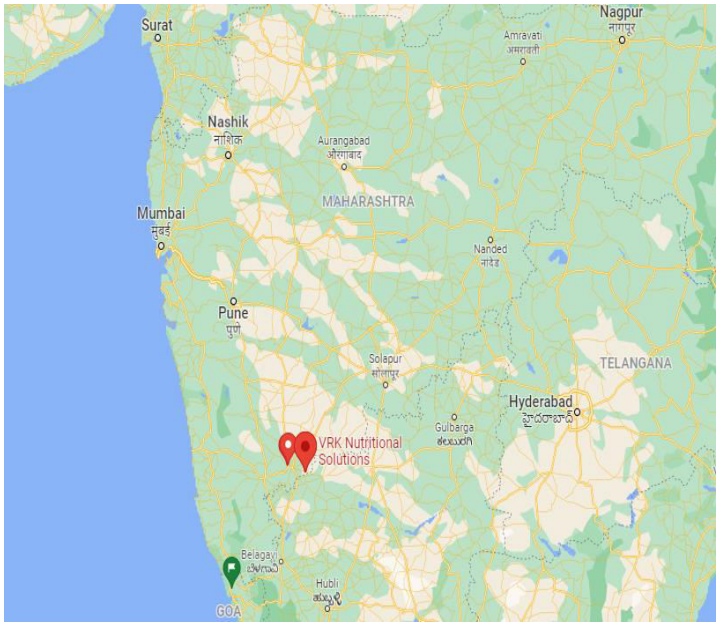
- Reduces outdoor air pollution, and increases use of manure rather than chemical fertilizers.
- Hygienic conditions are improved through reduction of pathogens by utilizing the organic wastes in the bio-digesters.
- Bio manure is a source of organic matter that stimulates biological activity.

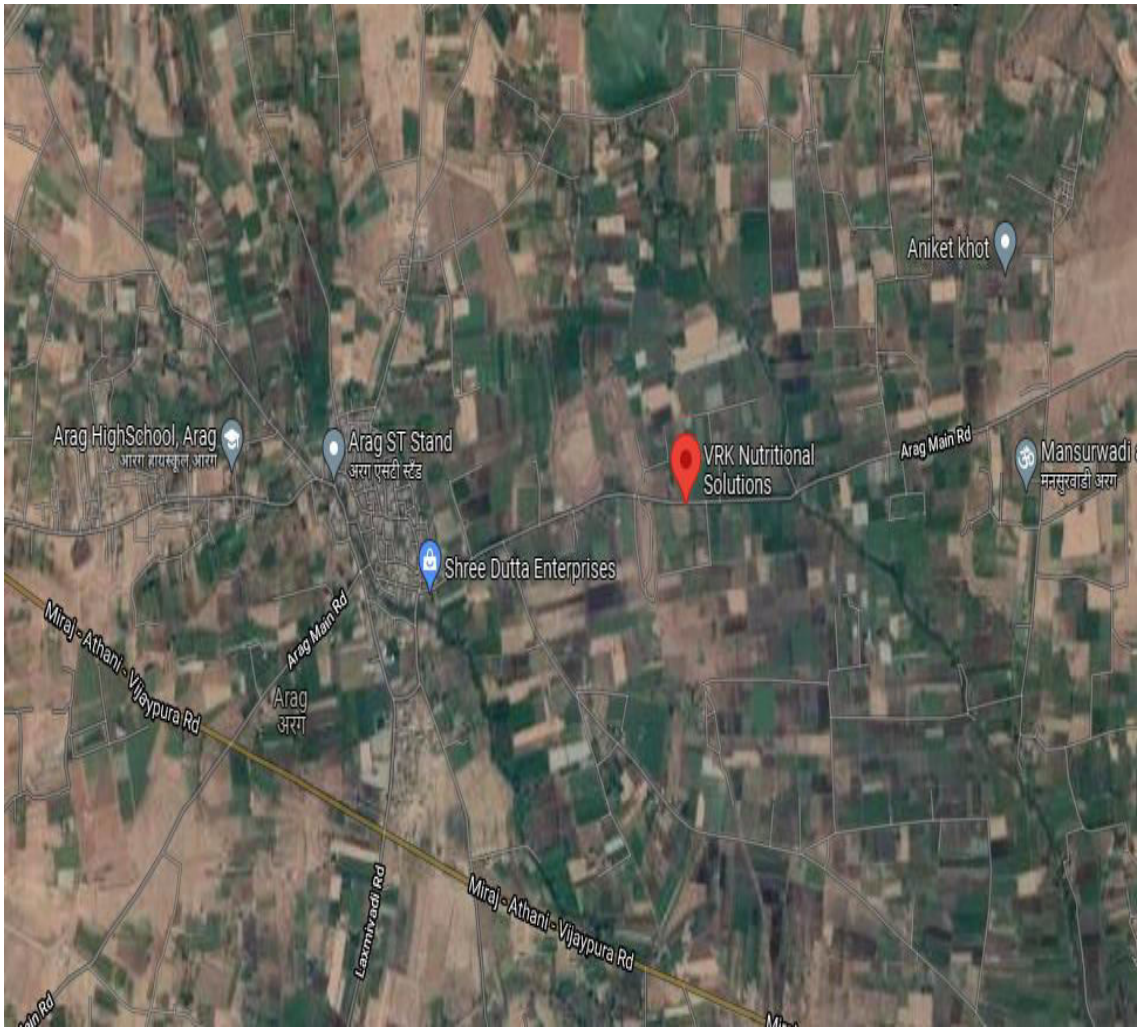
- **Economic benefits:**
- The project is among the few the region than captures biogas and uses the same for the generation of Bio-CNG for use in transport.
- Poultry litter is transformed into high-quality enriched bio-manure/fertilizer which is supplied to the retail marketplace, thus providing better soil enrichment for local gardens and parks.
- Provides employment to local communities through construction and maintenance of biogas units.
- The revenue from carbon credits will make it more attractive for the setup of similar projects across the State at scale and speed. Finance is another hurdle for setup of such biogas plants. A biogas plant is a large investment. However, revenue from the sale of carbon credits will force green entrepreneurs to give it a second thought under the UCR Program. India's biogas potential is 8 MTA from 500 million poultry birds.

A.3. Location of project activity >>

Country: India.

VRK Project Site — Arag Main Road, Village: Arag, District: Sangli, State: Maharashtra Pincode: 416401 (Lat: 16.7892198 Long:74.8015292)





A.4. Technologies/measures >>

Bio-methanation is a process by which organic waste is microbiologically converted under anaerobic conditions to biogas. It is the most energy efficient and eco-friendly method for treatment of poultry litter. With bio-methanation the project activity converts poultry litter to Bio-CNG and also good quality organic manure. VRK has set up a 2500 m^3 biogas digester which treats approximately 30 TPD of poultry litter at the site in Maharashtra where around 1000 kg Bio-CNG is bottled in cylinders.

The poultry litter from the poultry farm is received directly from conveyor belts attached to the poultry sheds within the project boundary and unloaded into the underground primary collection tank fitted with agitator to prepare homogenous slurry with a dry solid content of 20 %. The dry solid content of the homogenous slurry is measured periodically in the laboratory for ensuring the percentage of the dry solid content. The raw slurry from the underground RCC collection tank is fitted with submersible stirrer to homogenously mix the substrate.

Modified KVIC Floating Methanization Digesters: The project activity has a total of 1 independent biogas digester of 2500 m^3 capacity with arrangements of continuous stirring. The CSTR high rate digester treats poultry litter under anaerobic condition and converts 50 % of organic carbon to produce Biogas.

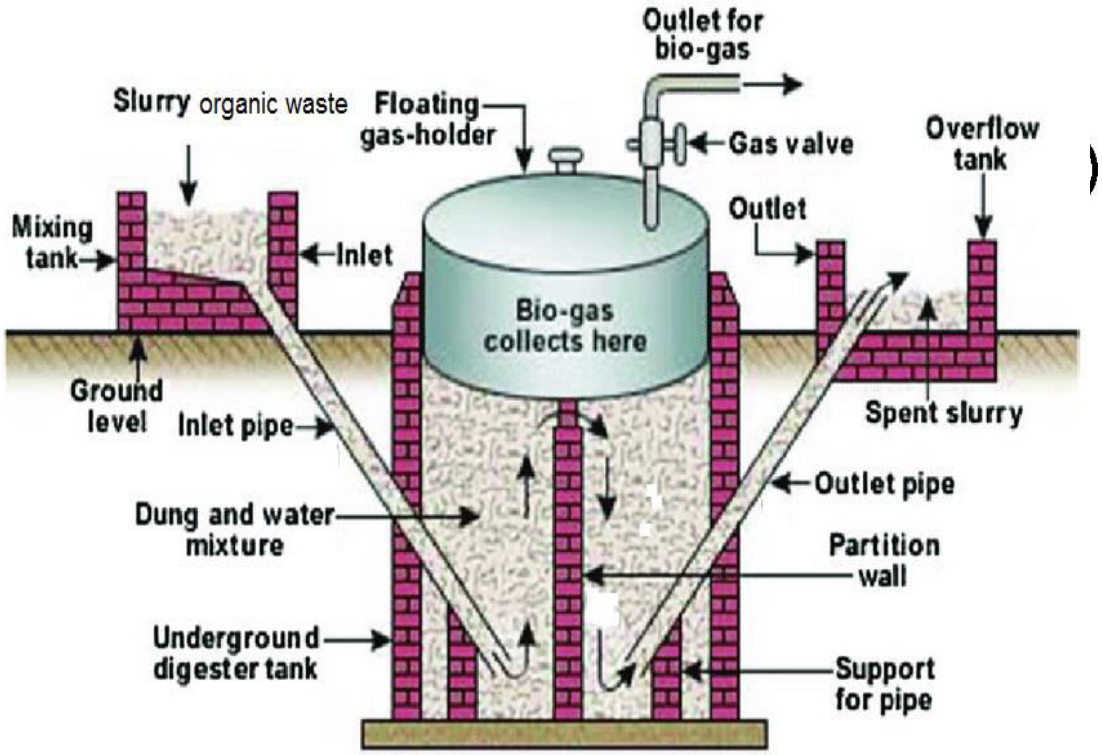
The retention time of slurry in the digester is 25 days with an operating temperature of 55˚C. The methanization digesters are fitted with stirrers that ensure dry solid control within the digester to an average value of 15%.

Processing of Treated Slurry: The treated slurry is dewatered and the dry cake is used as high quality organic fertilizer.

Biogas Storage System: The biogas from all the digesters are collected in a gas storage facility and then sent to balloon holding chamber.

Purification System: From the ballons, the raw biogas is sent to a compressor with processing and purification systems for the biogas to obtain up-graded biogas such that methane content, itsquality and the physical and chemical properties are equivalent to the CNG and this is in turn stored in Bio-CNG bottles for further use in the transport sector.

Biogas is a product from the process of degradation of organic matter by anaerobic bacteria. The biogas generation process consists of four subsequent chemical and biochemical reactions i.e. Hydrolysis reaction, Acidogenesis reaction, Acetogenesis reaction and Methanogenesis reaction.



Hydrolysis reaction decomposes organic molecule such as carbohydrates, proteins and fats into glucose, amino acids and fatty acids, respectively. Acidogenesis converts those generated small organic molecules to volatile organic acids with help from bacteria. During the Acetogenesis process, bacteria in the acetic group digests volatile organic acids and releases acetic acid. Lastly, anaerobic bacteria in the methanogenic producing bacteria group will complete the Methanogenesis process by converting acetic acid to methane gas and other gases like carbon dioxide and hydrogen

sulfide. Hydrogen sulfide is a corrosive gas. Presence of carbon-dioxide in the bio-gas reduces its calorific value. Hence the bio-gas needs to be purified. The raw Biogas is purified for methane enrichment by removal of other gases and purified gas have methane content of more than 93%.

The optimum utilization depends upon the successful physical installations, which in turn depend upon plant design and its selection. The basic conversion principle is that when a non-ligneous biomass is kept in a closed chamber for a few days, it ferments and produces an inflammable gas. The anaerobic digestion consists of three stages: I Hydrolysis; II Acid formation and III Methane fermentation. The processes are carried out by two sets of bacteria namely acid forming bacteria and methane formers. The acidogenic phase I is the combined hydrolysis and acid formation stages in which the organic wastes are converted mainly into acetate, and phase II is the methanogenic phase in which methane and carbon dioxide are formed. The better the three stages merge with each other, the shorter the digestion process.

The technical specifications of the modified KVIC model bio-digesters and resulting Bio CNG are as follows:

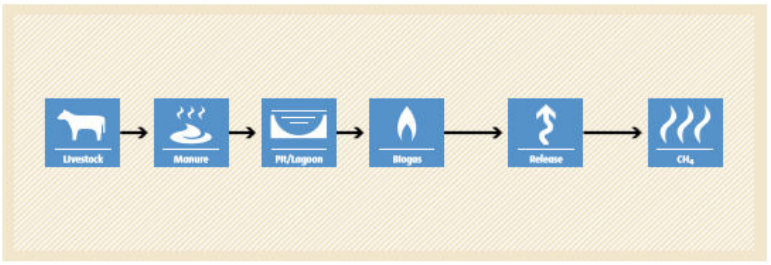
Specification	Value
Total Installed Capacity	2500 m^3
Mixing Proportion	(Water: Waste) 1:1
Number of units (digesters)	1
Feed Material	Poultry Litter
Biogas Flow rate	0.9 m^3/hr
Calorific Value Biogas from digester	20 MJ/m^3
Quantity of Organic Waste Treated	30 TPD
Bio CNG Calorific Value	52 MJ/kg
Air-Fuel Stoichiometric Ratio by volume	23.9 : 1
Density @ 1 ATM, 15 °C (kg/m3)	0.79
Autoignition Temperature (°C)	630 - 810
Toxicity	Non toxic even at high concentration & low levels of oxygen.
Concentration of methane in the biogas	0.43008kg CH_4/m^3 Applied an expected fraction of methane in biogas of 0.60 m3CH4/m3 multiplied by the density of methane at normal conditions of 0.7168 kg/m3

A.5. Parties and project participants >>

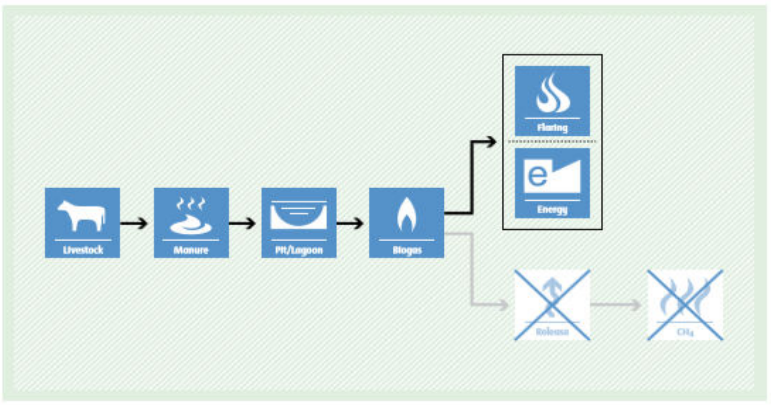
Party (Host)	Participants
India	Project Proponent: Urja Bio System Pvt. Ltd., Pune, Maharashtra, India Aggregator: Gram Vikas Trust UCR ID:741215693 Email:gvtbiogas@gmail.com

A.6. Baseline Emissions>>

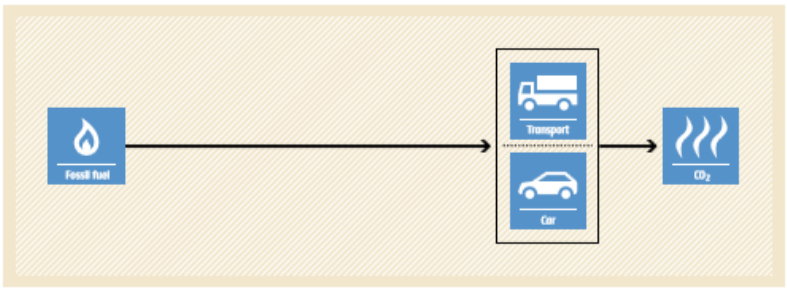
BASELINE SCENARIO
Animal manure is left to decay anaerobically and methane is emitted into the atmosphere.



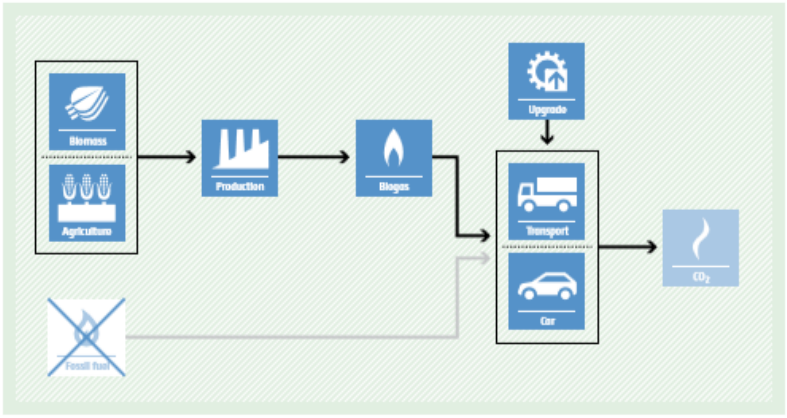
PROJECT SCENARIO
Methane is recovered and destructed or gainfully used due to replacement or modification of existing anaerobic manure management systems.



BASELINE SCENARIO
Gasoline or CNG are used in the baseline vehicles.



PROJECT SCENARIO
Only Bio-CNG are used in the project vehicles.



The baseline scenario identified at the PCN stage of the project activity is:

- the amount of Bio-CNG produced and distributed to replace fossil produced fuel,
- where, in the absence of the project activity, poultry litter is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere.

A.7. Debundling>>

This project activity is not a debundled component of a larger registered GHG project activity.

SECTION B. Application of methodologies and standardized baselines

B.1. References to methodologies and standardized baselines >>

SECTORAL SCOPE - 07 Transport
13 Waste handling and disposal

TYPE I – Renewable Energy.
TYPE III-Other Project Activities

CATEGORY- ***AMS-III.AQ.: Introduction of Bio-CNG in transportation applications, Version 2.0***

This methodology comprises activities for production of Biogenic Compressed Natural Gas (Bio-CNG) from biomass including biomass residues to be used in transportation applications. The project activity involves installation and operation of Bio-CNG plant that includes:

(a) Anaerobic digester(s) to produce and recover biogas;
(b) Biogas treatment system that includes processing and purification of the biogas to obtain up-graded biogas such that methane content, its quality and the physical and chemical properties are equivalent to the CNG;
(c) Filling stations, storage and transportation.

This methodology covers the use of Bio-CNG in various types of transportation applications such as Compressed Natural Gas (CNG) vehicles, modified vehicles. Examples include buses, trucks, three-wheeler, cars, jeeps, etc.

AMS-III.D: Methane recovery in animal manure management systems, Version 21.0

Replacement or modification of existing anaerobic manure management systems in livestock farms, or treatment of manure collected from several farms in a centralized plant to achieve methane recovery and destruction by flaring/combustion or energetic use of the recovered methane.

B.2. Applicability of methodologies and standardized baselines >>

The project activity involves installation and operation of Bio-CNG plant that includes:

- (a) Anaerobic digester(s) to produce and recover biogas;
- (b) Biogas treatment system that includes processing, purification of the biogas to obtain up-graded biogas such that methane content, its quality and the physical and chemical properties are equivalent to the CNG;
- (c) Filling stations, storage and transportation.

This project activity comprises measures to avoid the emissions of methane to the atmosphere from poultry litter within the project boundary.

No methane recovery and destruction by flaring or combustion for gainful use takes place in the baseline scenario.

The livestock population in the farm is managed under confined conditions

Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries);

The storage time of the poultry litter after removal from the poultry shed, including transportation, does not exceed 45 days before being fed into the anaerobic digester

The activities for production of Biogenic Compressed Natural Gas (Bio-CNG) are from poultry litter

Methane content of the upgraded biogas is in accordance with relevant national regulations and over the minimum volume specified for India.

Only the producer of the Bio-CNG is claiming emission reductions under this methodology.

Biogas treatment system that includes processing, purification of the biogas to obtain up-graded biogas such that methane content, its quality and the physical and chemical properties are equivalent to the CNG;

Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually

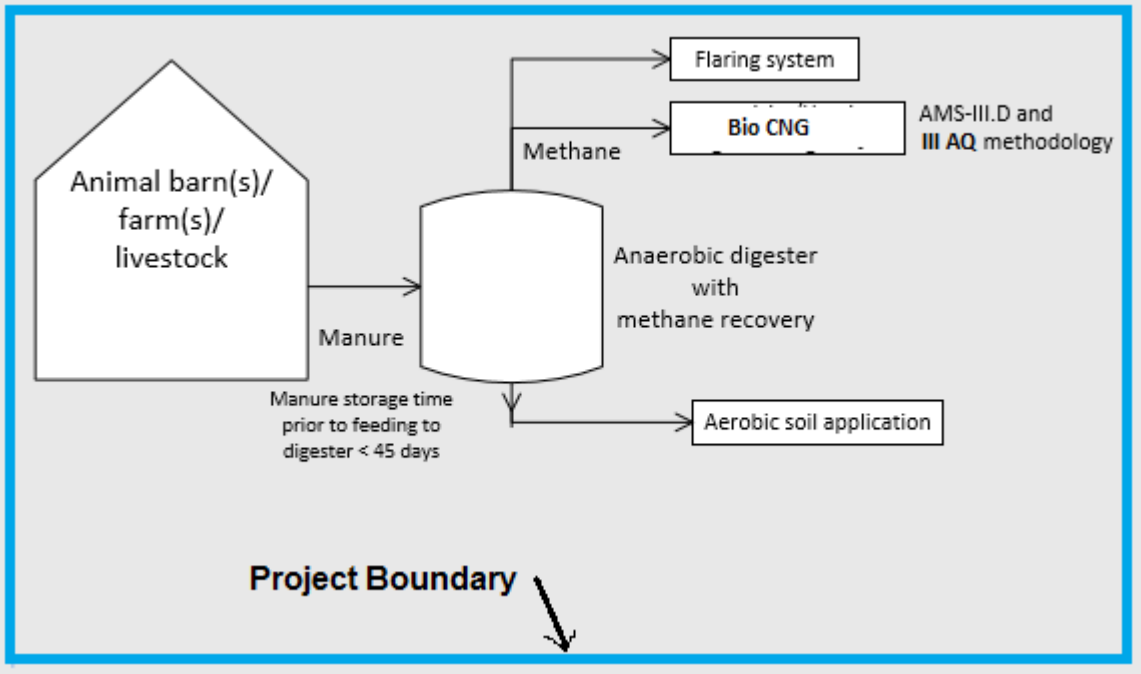
B.3. Applicability of double counting emission reductions >>

Each of the biogas unit is constructed within the project boundary and has a unique ID, which is visible on the biogas unit and log books. The Monitoring Report has the details of the same and the Unique ID. The project activity is not registered under any GHG program since being commissioned.

B.4. Project boundary, sources and greenhouse gases (GHGs)>>

The project boundary includes the physical, geographical site(s) of:

- The livestock
- The Bio-CNG plant;
- Biogas digester;
- Transportation Bio-CNG from biogas plant to filling stations where it is used by final consumers;



	Source	GHG	Included?	Justification/Explanation
Baseline	CO_2 emissions from CNG from fossil origin	CO_2	**Included**	Major source of emission
		CH_4	**Included**	Major source of emission
	CH_4 Emissions from poultry litter decay	N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	CH_4 Emissions from anaerobic digester CH_4 Emissions from flaring of the biogas	CO_2	Excluded	There is no incremental emissions related to transport of waste to project site as compared to the disposal site.
		CH_4	**Included**	Methane emissions due to physical leakages from the digester / recovery system and flaring per year
		N_2O	Excluded	Excluded for simplification. This is conservative

Leakage Emissions under AMS III. D is not applicable as the project technology is not transferred from another activity and neither is the existing equipment being transferred to another activity.
Leakage Emissions under AM III.AQ related to the substitution of Bio-CNG for CNG from fossil origin reduces indirect ("upstream") emissions associated with the production of fossil CNG and is treated as negative leakage, hence is not considered and is conservative in the approach to calculate baseline emissions.

B.5. Establishment and description of baseline scenario (UNFCCC CDM-UCR Protocol) >>

The baseline scenario under AMS III. D 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. Baseline emissions under AMS III.D (BE_{y1}) are calculated by using the following option:

a) Using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity, with the most recent IPCC Tier 2 approach (please refer to the chapter 'Emissions from Livestock and Manure Management' under the volume 'Agriculture, Forestry and other Land use' of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). For this calculation, information about the characteristics of the manure and of the management systems in the baseline is required. Manure characteristics include the amount of volatile solids (VS) produced by the livestock and the maximum amount of methane that can be potentially produced from that manure (Bo).

The baseline emissions under AMS III.AQ are calculated based on the amount of Bio-CNG produced and distributed, and it is applicable to project activities that use Bio-CNG in modified diesel vehicles and modified gasoline vehicles when such vehicles are not included in the boundary. All vehicles have been assumed to converted to run on natural gas, which is then considered being the baseline fuel.

Estimated Annual Emission Reductions: $BE_y = BE_{y1} + BE_{y2} - PE_{phy,leakagey} - PE_{flare,y}$

BE_y = Total Baseline Emissions in a year.

$$BE_{y2} = FS_{BIO\text{-}CNG,Y} \times NCV_{BIO\text{-}CNG} \times EF_{CO2,BIO\text{-}CNG}$$

$FS_{BIO\text{-}CNG,Y}$	Amount of Bio-CNG distributed directly to retailers, filling stations by the project activity in year y (tonnes)
$EF_{CO2,BIO\text{-}CNG}$	CO2 emission factor of CNG (tCO2e/GJ), determined using reliable local or national data (0.053 TCO2/GJ)
$NCV_{BIO\text{-}CNG}$	Net calorific value of Bio-CNG (GJ/tonne). For NCV of CNG, reliable local or national data shall the used. (43.5 GJ/T IPCC Default)

$$BE_{y1} = GWP_{CH4} \times D_{CH4} \times UF_b \times \Sigma MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{BI,j}$$

$$VS_{LT,y} = (W_{site}/W_{default}) \times VS_{default} \times nd_y$$

BE_{y1}	= 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 (VS) content
$N_{LT,y}$	= Average number of animals of type LT in a year
W_{site}	= Avg. Wt. at Site (poultry) in kg
$W_{default}$	= Avg. Default Wt. of (Chicken) as per IPCC for India in kg
nd_y	= Number of days in year y where the treatment was operational
$VS_{default\_cattle/poultry}$	= Volatile solids of livestock LT entering the animal manure management system in year y as per IPCC default for poultry in India
UF_b	= Model correction factor to account for model uncertainties (0.94) Default
VS_{jLTy}	= Specific volatile solids content of animal manure from livestock type LT and animal manure management system j in year y (tonnes/tonnes, dry basis) (Poultry=0.02). As per IPCC guidelines
D_{CH4}	= CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
MCF_j	= Annual methane conversion factor (MCF) for the baseline animal manure management system j (Poultry=2%), solid storage.
$B_{O,LT}$	= Maximum methane producing potential of the volatile solid generated for animal type LT (m^3 CH_4/kg dm) in Indian Subcontinent (Poultry =0.24). IPCC 2006 - IPCC Default Value taken for Indian Subcontinent
VS	= Volatile Solids

The feed digestibility in the range of 50 to 60% has been considered as appropriate for this PoA. The production of volatile solids is very much dependent on the feed digestibility levels.

		$VS_{Default,\ poultry}$ is the value for the volatile solid excretion rate per day on a dry-matter basis for a defined livestock population (kg dm/animal/day) = 0.01
GWP_{CH4}	=	21 is the default IPCC value of CH_4 applicable to the crediting period ($tCO_{2e}/t\ CH_4$)

Project Activity Emissions

Project activity emissions consist of:

(a) Methane emissions from physical leakages of the anaerobic digester;

(b) Methane emissions due to flare inefficiency;

PE $_{transport}$ = Nil. Emissions from incremental transportation in the year y (t CO2e), and physical leakage is negligible since the dung and poultry litter is generated within the project boundary of all the sites in the project activity.

PE $_{power,\ y}$ = Nil. The captive power requirements at the project activity site are met by biogas power derived from the biogas digesters. No fossil fuel is used for power generation within the project activity. The biogas based electricity generated for captive use. The use of the recovered biogas is within the project boundary and its output is monitored in order to ensure that the recovered biogas is actually destroyed. Project emissions on account of storage of poultry litter before being fed into the anaerobic digester is not accounted since the storage time of the poultry litter after removal from the cages, including transportation, does not exceed 24 hours before being fed into the anaerobic digester.

$PE_{phy,leakage\ y}$ = Methane emissions due to physical leakages from the digester and recovery system are considered.

$PE_{flare,y}$ = Methane emissions due to incomplete flaring in year *y* as per the "Tool to determine project emissions from flaring gases containing methane"(tCO_2e).

Year	Emission Reductions
2020	16456
2021	16456
Total	32912

Estimated baseline emission reductions (BE_y) = 32912 CoUs (32912 tCO_{2eq})

B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon

offsets or credits.

B.7. Changes to start date of crediting period >>

There is no change in the start date of crediting period.

B.8. Permanent changes from PCN monitoring plan, applied methodology or applied standardized baseline >>

There are no permanent changes from registered PCN monitoring plan and applied methodology

B.9. Monitoring period number and duration>>

First CoU Issuance Period: 1 year, 11 months
Date: 20/01/2020 to 30/11/2021
Monitoring Period: 1

B.8. Monitoring plan>>

Relevant parameters shall be monitored as indicated in the below.

No.	Parameter	Description	Unit	Monitoring/recording Frequency	Measurement Methods and Procedures
1	Q_y,	Quantity of poultry litter	tons	Monthly	On-site data sheets recorded monthly using weigh bridge. Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier)
2	$w_{CH4,y}$	Methane content in biogas in the year *y*	%		As per the relevant procedure in AMS-III.H
4	T	Temperature of the biogas	^oC		As per the relevant procedure in AMS-III.H
5	P	Pressure of the biogas	Pa		As per the relevant procedure in AMS-III.H
6	FE	The flare efficiency	%		As per the "Tool to determine project emissions from flaring gases containing Methane". Regular maintenance shall be carried out to ensure optimal operation of flares

Data/Parameter	N_L
Data unit	Number
Description	Number of head of poultry birds
Source of data Value(s) applied	Head count of poultry birds, whose waste is used for generating biogas
Measurement methods and procedures	Based on back-calculation of poultry litter requirement of the plant. Poultry average generation data (i.e. 40 g / head / day).
Monitoring frequency	As and when commissioned and fixed and recorded in the monitoring report
Purpose of data	To estimate baseline emissions

Data/Parameter	Date of commissioning of biogas unit
Data unit	Date.
Description	Actual date of commissioning of the project device
Source of data Value(s) applied	Monitoring Report As and when commissioned
Measurement methods and procedures	The construction processes are maintained from its initiation to completion dates for the biogas unit. Thus the start date of each of the unit installed is recorded in the monitoring report.
Monitoring frequency	As and when commissioned and fixed and recorded in the monitoring report
Purpose of data	To estimate baseline emissions

Data / Parameter:	NCV_i
Data unit:	GJ/t
Description:	Methane content in biogas in the year *yNet calorific value of gasoline/blended gasoline that was used by project vehicle k*
Source of data:	Measured according to relevant national/international standards
Measurement procedures (if any):	NA
Monitoring frequency:	At verification and annually during the crediting period
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$w_{CH4,y}$
Data unit:	%
Description:	*Methane content in the Bio-CNG*
Source of data:	-
Measurement procedures (if any):	The fraction of methane in the gas is to be measured with a continuous analyzer or, alternatively, with periodical measurements at a 90/10 sampling confidence/precision level. It shall be measured using equipment that can directly measure methane content in the biogas.
Monitoring frequency:	Continuous/periodic
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	**VS**
Data unit:	kg/head/day
Description:	Volatile Solids production per head
Source of data	IPCC 2006 Guidelines for National Greenhouse Gas Inventories under the volume 'Agriculture, Forestry and other Land use' for 'Emissions from Livestock and Manure Management' -
Measurement procedures (if any):	Poultry=0.02
Monitoring frequency:	NA
QA/QC procedure	The project proponent has used a combination of the field values and the IPCC default values to estimate the baseline emissions and an assessment on its suitability has been provided. It also ensures that the baseline emissions are calculated in a conservative manner
Any comment:	Baseline Emissions

Data / Parameter:	$NCV_{Bio\text{-}CNG}$
Data unit:	GJ/t
Description:	*Net calorific value of Bio-CNG*
Source of data:	-
Measurement procedures (if any):	Measured according to relevant national/international standards through sampling
Monitoring frequency:	Monthly or as prescribed by the applied national/international standard
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$FP_{Bio\text{-}CNG,y}$
Data unit:	t
Description:	Quantity of the Bio-CNG produced by the project activity in the year y
Source of data:	-
Measurement procedures (if any):	Measurements are undertaken using calibrated meters at the outlet of the biogas upgrading section of the Bio-CNG production site
Monitoring frequency:	Continuously
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	$FS_{Bio\text{-}CNG,y}$
Data unit:	t
Description:	*Amount of Bio-CNG distributed/sold directly to retailers, filling stations by the project activity in year y*
Source of data:	Measurements of the amount of Bio-CNG distributed/sold to retailers/filling stations are undertaken using calibrated meters at the delivery section of Bio-CNG production site. Measurements results shall be cross checked with records for sold amount (e.g. invoices/receipts) and with the amount of biogas produced
Measurement procedures (if any):	Continuously or in batches
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	N_y
Data unit:	Number of operational days in a year
Description:	Measured
Source of data:	-
Measurement procedures (if any):	Records kept in the log book.
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	MCF
Data unit:	%
Description:	Annual methane conversion factor. The MCF indicates the extent to which, under certain conditions, the degradable substances will actually be converted into methane.
Source of data:	-IPCC Guidelines
Measurement procedures (if any):	AMS-III.D provides three options for obtaining the manure production and methane production potential. These include: ∟ Data from nationally published sources; ∟ Estimated from actual feed intake levels, via the enhanced characterisation method (tier 2) ∟ Default values provided in 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 chapter 10. The project proponent has used the IPCC default values to estimate the baseline emissions. It also ensures that the baseline emissions are calculated in a conservative manner.
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	-
Any comment:	-Baseline emissions are calculated in a conservative manner.