PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

**

Title: Waste to
Energy- Xeon Biogas Project"
Version 1.0
Date 29/07/2022
First CoU Issuance Period:5 years, 3 months
Date: 07/04/2018 to 05/06/2022

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

BASIC INFORMATION	
Title of the project activity	Waste to Energy- Xeon Biogas Project
Scale of the project activity	Small scale project activity
Completion date of the PCN	29/07/2022
Project participants	Xeon Waste Managers Private Limited
Host Party	India
Applied methodologies and standardized baselines	AMS III-AO- Methane recovery through controlled anaerobic digestion
Sectoral scopes	SELECT SCOPE 13-Waste handling and disposal
Estimated amount of total GHG emission reductions	CoUs (7406 tCO_{2eq})

SECTION A. Description of project activity

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

The **Waste to Energy- Xeon Biogas Project** is located in following places in India

Project details	***Location (State, Country)***
The project is a bundled project with capacity of **30.84 TPD** of Xenon Biogas digester installed in various parts of India.	Noida, Mathura, Rihan Nagar in Uttar Pradesh Haldia, Barrackpore, Kolkata, Jhargram in West Bengal Bokaro in Jharkhand Ponda in Goa Bellary in Karnataka Jamnagar in Gujrat Mumbai, Pune, Dolvi in Maharashtra Faridabad, Haryana Guwahati, Assam

The details of the registered project are as follows

Purpose of the project activity:

The purpose of the project activity is to install 30 TPD of Biogas digester till date in phases, manufactured by Xenon Waste Managers Pvt Limited. The project developer installs the digester to treat the municipal solid wastes that get generated from the households in the corporations, market complex, gardens and in government offices. The collected Municipal solid waste from the households including door to door picking includes mainly organic food waste/sanitary medicinal waste/plastic waste and garden waste. There are separate bags used by households to segregate the waste at source. Apart from source segregations the wastes are again separated at central collection points as planned by the project developer.

The project developer has employed around 15 employees employed to collect the wastes from households and the other producers through cycle rickshaws employed with waste bin. The type of waste collected and its details are monitored through radio frequency identification cards that is installed in each household.

The different type of wastes collected are segregated as

- Organic waste that include food waste, which is fed to digester for biogas generation
- Garden waste from falling trees and branches/leaves/twigs are collected and made as bio pellets to be used by the local industries as alternate fuel source
- Dry waste includes Plastic wastes/electronic wastes/cardboard wastes/metals/glass bottles are sent to recyclers
- Bio medical waste and sanitary wastes are separated and sent to bio medical treatment centre

The segregated organic food wastes are used by the bio methanisation unit to convert into biogas and the end product is used as an alternate source of fuel (biogas) for cooking (thermal) and Electrcicity generation in the nearby localities like hospitals. The project activity thereby reduces the waste dumping in the landfills and prevents landfill gas (methane) generation and also displaces the thermal/electricity

generation through fossil fuel combustions. The Emission reduction achieved through prevention of methane emission through landfilling is around 7406 t CO2/Annum. The Emission reductions through displacement of LPG use for cooking /fossil fuels through electricity generation are not accounted and emission reductions are not claimed for the project end usage.

The project activity is developed in accordance with the guidance, rules and requirement of Swacch Bharat Mission and governing rules and guidelines. The Swacch Bharat mission lays importance on Waste collection, segregation, transportation, recycling and conversion to useful energy source.

YEAR	RULES, POLICIES, SCHEMES, FINANCIAL PLANS
1989	The Hazardous Waste (M&H) Rules
1994–1995	MSWM strategy paper by NEERI
	J.S. Bajaj Committee (The High Powered Committee on Urban Solid Waste Management)
1998	Bio-medical Waste (M&H) Rules
	Supreme Court appointed Barman Committee
2000	MSW (M&H) Rules
	CPHEEO Manual on MSW
2005	Report of the Technology Advisory Group on SWM
	JNNURM (2005–2012)—40 MSW projects costing Rs. 2,186 Cr sanctioned from a total of 65 cities covered
	UIDSSMT (2005–2012)—51 MSW projects costing Rs. 327 Cr sanctioned from a total of 632 cities covered
	12th Finance Commission (2005–2010)—Rs. 2,500 Cr for 423 Class I cities
2006	Strategy and Action Plan-Use of compost in cities
2007	11th Five-Year Plan (2007–2012)—Rs. 2,210 Cr for MSWM
2008	National Urban Sanitation Policy (NUSP)
	Service Level Benchmarks (SLBs) in MSWM
	Hazardous Waste (Management, Handling & Transboundary Movement)Rules
	National Mission on Sustainable Habitat (NAPCC)
2010	13th Finance Commission (2010–2015)—Establishing standards for delivery of essential services
2011	Plastic Waste (M&H) Rules
	E-Waste (M&H) Rules
	Draft Bio-medical Waste (M&H) Rules
2014	Swachh Bharat Mission, October 2014
2016	Waste Management Rules, 2016 comprising of Solid Waste Management Rules, Plastic Waste Management Rules, Bio-Medical Waste Management Rules,

Project details

Client details	Project capacity (TPD)	Comissioning dates	Type of waste input(Feedstock)
Year 2022-23			
Waste Management Corporation-RWA Noida 1 Sec 50	2.5	**5.6.2022**	Organic Municipal Solid Waste
IOCL Mathura	0.15	**5.5.2022**	Food Waste
Jhargram MuncipalityRamkrishna Mission	0.2	**5.5.2022**	Food Waste
NTPC- Rihand Super Thermal Power Station	0.3	**15.3.2022**	Food Waste
New Town Kolkata Development Authority	5	**10.4.2022**	Organic Municipal Solid Waste
Year 2021-22			
Pune Municipal Corporation	0.2	**20.10.2021**	Organic Municipal Solid Waste
SteelAuthority of India Limited-Bokaro	0.5	**8.06.2021**	Food Waste
Nestle India Ltd, Ponda Goa	0.3	**26.02.2021**	Food Waste
South Eastern Railway- Garden Reach	1	**11.01.2021**	Organic Waste
Indian Oil Corporation Limited,Haldia township	0.25	**12.1.2021**	Food Waste
Pune Municipal Corporation	0.2	**20.10.2021**	Organic Municipal Solid Waste
Year 2020-21			
JSW Cement Limited	0.075	**20.11.2020**	Food Waste
West Bengal livestock development coorporation, piggery	2.5	**9.10.2020**	Piggery Waste
Waste Management Corporation- MIG Flats 15 Noida Section 100	2.5	**29.9.2020**	Food Waste
Waste Management Corporation-RWA Noida Section 5 1	1.5	**11.5.2020**	Organic Municipal Solid Waste
Waste Management Corporation-Continental 17 Milkose India Limited	0.1	**21.2.2020**	Food Waste
Waste Management Corporation, RWA-NOIDA 18 Sector 52	2.5	**14.02.2020**	Organic Municipal Solid Waste
Indian Oil Corporation Limited,refinery	0.5	**3.1.2020**	Food Waste

The Akshaya Patra Foundation, Jamnagar	1	**5.6.2022**	Food Waste
Year -2019-20			
Tata Motors Car Plant Pimpri (Pune)	1.5	**29.10.2019**	Food Waste
JSW Steel Limited	1	**2.10.2019**	Food Waste
Texol Engineering Private Limited-10CL (R&D)	5	**26.02.2019**	Food Waste
Swami Vivekanand State Police Academy	0.25	**02.02.2019**	Food Waste
Year -2018-19			
International Crops Research Institute for the 24 Semi-Arid Tropics	0.1	**2.08.2018**	Food Waste
Garden Reach Shipbuilders & Engineers Limited, Kolkata	0.15	**6.06.2018**	Food Waste
The Akshyapatra Foundation- Guwahati	0.5	**20.5.2018**	Food Waste
Burckhardt Compression (India) Private Limited	0.075	**3.5.2018**	Food Waste
MCGM & Pali Hill RWA	1	**7.4.2018**	Food Waste

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.

The project activity contributes to following social, economic, environmental benefits as per the Sustainable development indicators of India

Social benefits:

- The Project activity will act as a revenue source, improve and uplift the life of the people
- The project activity reduces consumption of conventional fuels like wood for its cooking purpose and thereby help in reducing the fossil fuel and it is clean fuel with less emission source when compared to conventional method of cooking
- The Biogas stoves are safer to operate than conventional fuels.
- It is simple low cost technology that saves money for the users

Environmental benefits:

- The project activity causes less pollution when compared to the conventional methods The health of woman due to indoor pollution gets reduced and the global environmental pollution also gets reduced through prevention of methane and CO2 emissions into the atmosphere, which caused global warming
- The manure can be used as bio fertilizers there by reducing chemical fertilizer usage and soil pollution
- The slurry that is returned after the biogas system process is superior in terms of its nutrient content as the process of methane production serves to narrow the carbon: nitrogen ratio (C: N).

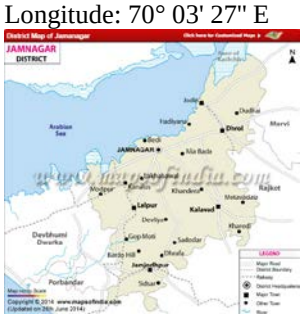
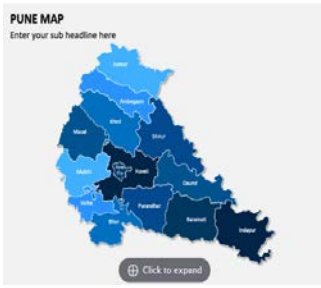
Economic benefits:

- The technology is low cost and help in cost savings for the family and institution who use it The technology is environmental friendly initiative that provide /create jobs for the local people and help in local development and business opportunities gets widen with the technology penetration. The project promotes sustainable development through utilisation of alternate source of green fuel, that helps in economic and technological development of the people.

A.3. Location of project activity >>

Project details	*Location (State, Country)*	
The project is a bundled project with capacity of 28 TPD of Xenon Biogas digester installed in various parts of India.	**Noida, Mathura, Rihan Nagar in Uttar Pradesh**	Country: India District: Mathura Village: Tehsil: Mathura State: Uttar Pradesh Code: 09 Latitude: :27° 29' 43" N N Longitude: 77° 40' 23" E Country: India District: Noida Village: Tehsil: Noida State: Uttar Pradesh Code: 09 Latitude: 28° 32' 07" N Longitude: 77° 23' 27" E Country: India District: Sonebhadra Village: Rihan Nagar Tehsil: Sonebhadra State: Uttar Pradesh Code: 09 Latitude: 24° 02' 04" N Longitude: 82° 48' 36" E 
	Haldia, Barrackpore, Kolkata, Jhargram in West Bengal	Country: India District: Purba Medinipur Village: Haldia Tehsil: Purba Medinipur State: West Bengal Code: 19 Latitude: 22° 03' 45" N Longitude: 88° 04' 59" E Country: India District: North 24 Parganas Village: Barrackpore Tehsil: North 24 Parganas State: West Bengal Code: 19 Latitude: 22° 46' 02" N Longitude: 88° 23' 18" E Country: India District: Kolkata Village: Tehsil: Kolkata State: West Bengal Code: 19 Latitude: 22° 34' 21" N Longitude: 88° 21' 50" E    Country: India District: Jhargram Village: Tehsil: Jhargram State: West Bengal Code: 19 Latitude: 22° 27' 17" N Longitude: 86° 59' 50" E

	Bokaro in Jharkhand	 Country: India District: Bokaro Village: Tehsil: Bokaro State: Jharkhand Code: 20 Latitude: 23° 40' 09" N Longitude: 86° 09' 04" E 
	Ponda in Goa	Country: India. District: North Goa Village: Tehsil: Ponda State: Goa Code: 30 Latitude: 15° 24' 09" N Longitude: 74° 00' 27" E 
	Bellary in Karnataka	Country: India. District: Bellary Village: Tehsil: Bellary State: karnataka Code: 29 Latitude: 15° 08' 21" N Longitude: 76° 55' 17" E

	Jamnagar in Gujrat	 Country: XYZ. District: Jamnagar Village: Tehsil: Jamnagar State: Gujrat Code: 24 Latitude: 22° 28' 14" N Longitude: 70° 03' 27" E 
	Mumbai, Pune, Dolvi in Maharashtra	Country: India District: Raigad Village: Dolvi Tehsil: Raigad State: Maharashtra Code: 27 Latitude: 18 ° 42' 07" N Longitude: 73° 02' 59" E   Country: India District: Pune Village: Tehsil: Pune state: Maharashtra Code: 27 Latitude: 18° 31' 13" N Longitude: 73° 51' 24" E  Country: India District: Mumbai Village Tehsil: Mumbai State: Maharashtra Code: 27 Latitude: 19° 04' 33" N Longitude: 72° 52' 39" E

	Faridabad, Haryana	Country: India. District: Faridabad Village: Tehsil: Faridabad State: Haryana Code: 06 Latitude: 28° 24' 32" N Longitude: 77° 19' 04" E 
	Guwahati, Assam	Country: India. District: Guwahati Village: Tehsil: Guwahati State: Assam Code: 18 Latitude: 26° 06' 56" N Longitude: 91° 42' 31" E 

PC- 003- Thyssenkrupp

PC- 0014- TCS Kolkata

PC- 0019- GRSE Kolkata

PC- 0029- TATA MOTORS

PC- 0051- IOCL Mathura

PC- 0033- IOCL HALDIA

PC- 0026- Police Academy WB

PC- 0032- Milkose

PC- 0047- NKDA

PC- 0034- WBLDCL

PC- 0049- Nestle

PC- 0040- JSW Cement

PC- 0017- Indore

PC- 0031- Sec 52 Noida

PC- 0024- PMC

PC- 0030- Akshay Patra Jamnagar

PC- 0053- EKAM (TAPF Udaipur)

PC- 0054 GRSE Kolkata

A.4. Technologies/measures >>

Describe in detail the technologies or workings of the system. Provide diagrams of flow, process flow chart (cradle to grave), critical systems, overview of design etc. Mention the renewable fuel, process involved, end use. Provide installation tables if the project activity involves multiple sub installations in phased approaches etc. Provide pictures where applicable of the installation or technology.

The biogas plant consists of one or two digester units and the all-in-one unit, which incorporates all the required technical modules for control and power generation. There are also many options for extending the plant. All interfaces are matched to each other exactly.

The beauty of the plant is that it can be relocated as and when required, with an ease.

- **The advantages of EnergyBin™ at a glance**
- NexGen patented technology
- Uncomplicated installation and quick start-up
- Modular system: flexible in terms of set-up and operations & maintenance.
- Interfaces perfectly matched one to the other
- High-quality components and parts, low maintenance operation

- Stand-alone operation possible
- Can be integrated into existing infrastructure
- Can be expanded if necessary

Model EB – 500	**Model EB – 750**	**Model EB – 1000**	
Processed organic waste (kg)	500	750	1000
Number of operating days(d)	360	360	360
Total waste per annum (kg)	1,80,000	2,70,000	3,60,000
CO_2 Prevented (kg)	15,1812	2,27,718	3,03,624
Biogas Produce (m3)**	40	60	80

A.5. Parties and project participants >>

Party (Host)	Participants
India	Xeon Waste Managers Pvt Ltd Suite # 5D, Aria Signature Tower, JW Marriott, Aerocity

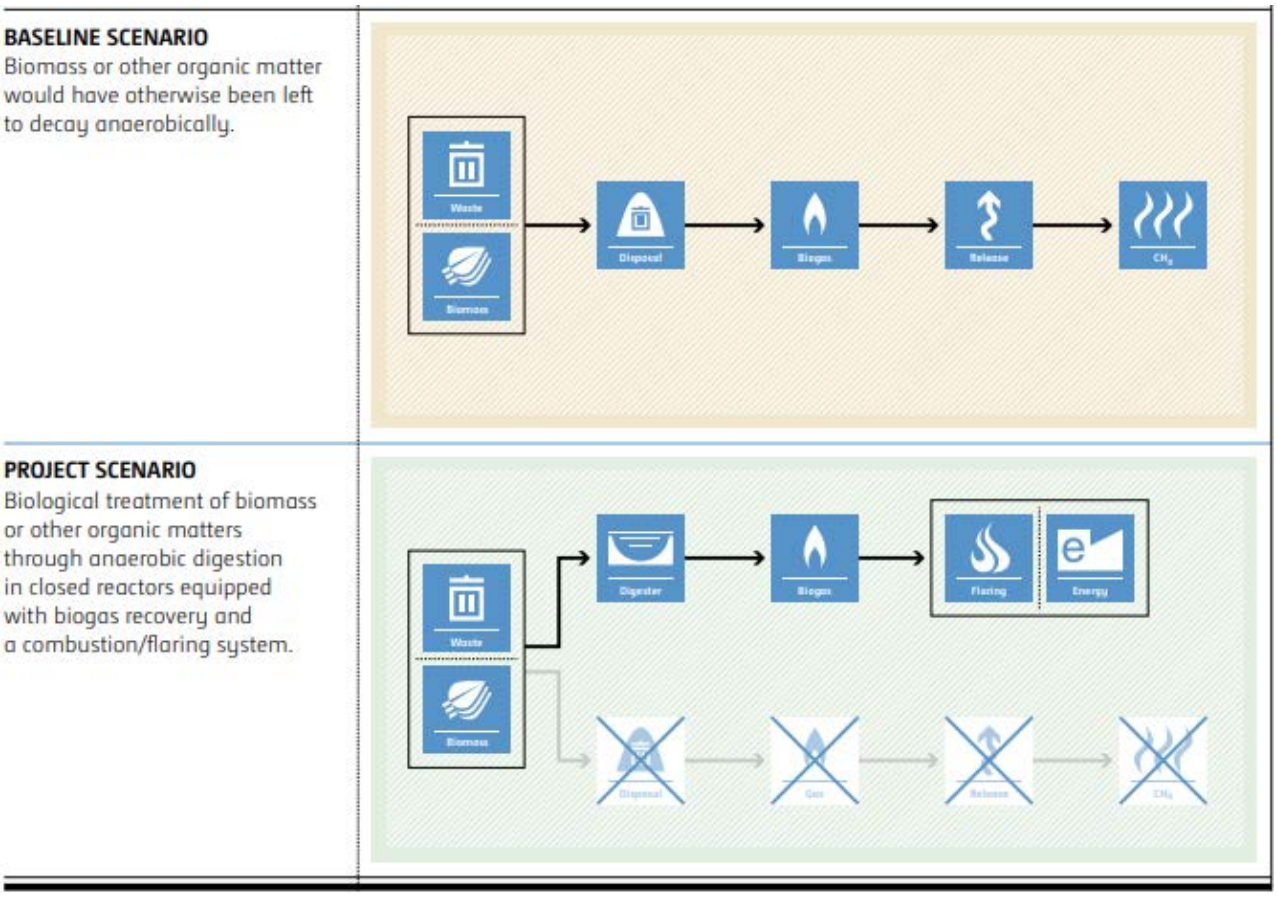
A.6. Baseline Emissions>>

The baseline scenario identified at the PCN stage of the project activity, as per the paragraph 12, of AMS III.AO, The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass and other organic matter

In the absence of the project activity the Municipal solid waste generated will be dumped in the landfill uncontrollably and The baseline scenario is the situation where, biomass and other organic matter are left to decay within the project boundary, and methane is emitted to the atmosphere.

AMS III AO
CDM: Methane recovery through controlled anaerobic digestion --- Version 1.0 (unfccc.int)

EXAMPLE



A.7. Debundling>>

This Waste to Energy- Xeon Biogas Project project is not a debundled component of a larger project activity.

SECTION B. Application of methodologies and standardized baselines

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

SECTORAL SCOPE –
01 Renewable Energy
13 Waste handling and disposal

TYPE
I –Renewable energy
III -Other Project activities

CATEGORY –Single project

AMS III.AO- Methane recovery through controlled anaerobic digestion, Version 1
CDM: Methane recovery through controlled anaerobic digestion --- Version 1.0 (unfccc.int)

Tools referenced in this methodology:
Tool to calculate project or leakage CO2 emissions from fossil fuel combustion
Emissions from solid waste disposal sites Project emissions from flaring
Tool to calculate the emission factor for an electricity system

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

Applicability criteria as per AMS III.AO, Version 01

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: **The project activity comprises of biogas generation from the MSW waste, which is used as a fuel source for cooking appliances and generate electricity, that would have been left to decay in solid waste disposal site or animal waste management system.**
Co-digestion[1] 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; **The project activity involves multiple biomass substrate like MSW. Organic Waste, Animal waste and the organic matter left to decay without biogas recovery in the baseline activity.Hence it is applicable**

[1] Co-digestion is the simultaneous digestion of a homogenous mixture of two or more substrates from different sources, e.g. co-digestion of MSW (municipal solid waste) and animal manure and/or domestic/industrial wastewater. The most common situation is when a major amount of a primary basic substrate (e.g. manure) is mixed and digested together with minor amounts of other substrates.

If for one or more sources of substrates, it can not be demonstrated that the organic matter 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;Project participants shall apply the procedures related to"competing use for the biomass" according to the latest "General guidance on leakage in biomass project activities"

All the organic matter is demonstrated to get digested anaerobically and hence it is not applicable

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";

The project activity does not treat animal manure alone. Hence it is not applicable

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.

The project activity does not recover landfill gas, controlled gasification and waste water treatment system. Hence AMS III G, AMS III E and AMS III H is not applicable

Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

The project activity result in emission reduction less than 60ktCO2 annually. Hence it is applicable.

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 location and characteristics of the disposal site is known and hence it is not applicable.

The following requirement shall be checked *ex ante* at the beginning of each crediting period:

- 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 Establish that it is common practice in the region to dispose of the waste in solid waste disposal site (landfill/stockpile).
- In the absence of the project activity, the MSW is allowed to dump in the landfill identified and it is a common practice followed. Hence it is applicable

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. Once defined, the boundary should not be changed during the crediting period(s).

The distance from the area waste is collected and processed and the use of end product of digester is less than 200 KM. Hence it is not applicable

5. 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

There is no aerobic treatment of waste and hence it is not applicable

6. 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.

The residual waste is not treated mechanically /Thermally hence it is not applicable

7. 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".

The residual slurry is not stored or landfilled .Hence not applicable

8. 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 of the digester is not discharged into wastewater hence it is not applicable

9. Technical measures shall be used to ensure that all biogas captured from the digester is combusted/flared.

The biogas is not flared and hence it is not applicable

10. All the applications to utilise 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

(a) Thermal or mechanical,[2] electrical energy generation directly;

The project activity uses biogas for electrical/thermal energy and it is not claimed

[2] For example combusted in a prime mover such as an engine coupled to a machine such as grinding machine.

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

Each biogas digester that treat anaerobic waste is built near the household community with unique ID within the community compound. Hence there is no double counting involved.

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

The project boundary is the physical, geographical site:

(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;

(b) In the case of projects co-digesting wastewater, where the wastewater would have been treated anaerobically in the absence of the project activity;

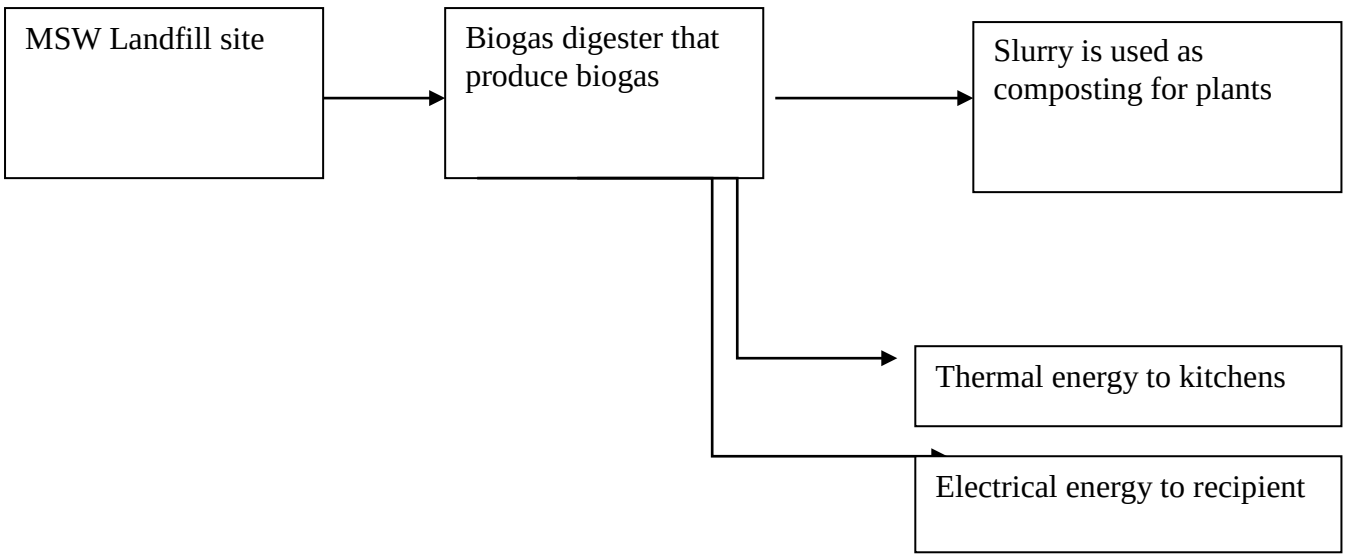
(c) Where the treatment of biomass or other organic matters through anaerobic digestion takes place;

(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;

(e) Where biogas is burned/flared or gainfully used, including biogas sale points, if applicable;

(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.

SCHEMATIC OR DIAGRAM SHOWING BOUNDARY



PROVIDE THE FOLLOWING TABLE AS NECESSARY FOR GHG SOURCES, LEAKAGE ETC INCLUDED AND EXLCUDED

EXAMPLE	Source	GHG	Included?	Justification/Explanation
Baseline	Emission from MSW landfill site	CO_2	Excluded	Minor source of emissions
		CH_4	Included	Major source of emission
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Emissions from on-site electricity use	CO_2	Included	Electricity is generated from collected biogas, hence these emissions are not accounted for. CO_2 emissions from the decomposition of organic waste are not accounted
	Emissions from residue from anaerobic digester composting	CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

B.5. Establishment and description of baseline scenario (UCR Standard or Methodology) >>

The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass and other organic matter. Baseline emissions shall exclude emissions of methane that would have to be captured, fuelled or flared or gainfully used to comply with national or local safety requirement or legal regulations.

The Municipal solid waste that consist of organic waste/Animal waste are left to decay in the landfill anaerobically and the methane is emitted into the atmosphere causing GHG emissions in the absence of the project activity. The dumping of waste is the business as usual scenario for the project activity and the project proponent invested in the project to prevent methane emission that cause GHG emissions into the atmosphere and to follow Swacch Bharat mission of Clean India.

The project activity follows following criteria

• **Voluntary (e.g. not legally required)** The project is not required by a legal mandate and does not implement a legally enforced mandate (government regulation or law);

• Early Action Projects (Commissioned on or after January 01, 2002). Unlike other centralized programs, the decentralized UCR Standard rewards projects that have taken early action in combating

climate change since the scope of additionality has been reset from proving counterfactual assumptions.

• **Verifiable:** UCR Standard projects must be currently operational and have data that can be independently audited externally.

• **Permanence:** All UCR Standard projects quantify emission reductions that are ex-post.

• **Conservative** in its emission reduction estimate based on a pre-defined list of emission factors to be used in quantifying the emission reduction

The capacity of each digester unit and its emission reductions are calculated as per CDM methodology.

Estimated Emission Reductions:

The emission reductions will be calculated as follows and the following monitoring requirements apply:

The emission reductions achieved by the project activity will be determined *ex post* through direct measurement of the amount of biogas fuelled, flared or gainfully used. It is possible that the project activity involves biomass treatment with higher methane conversion factor (MCF) than the MCF for the biomass which otherwise would have been left to decay in the baseline situation. Therefore the emission reductions achieved by the project activity is limited to the *ex post* calculated baseline emissions minus project and leakage emissions using the actual monitored data for the project activity (e.g. Q_y, and fossil fuels/electricity used). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\left[\begin{array}{l}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{array}\right] \quad \textbf{(1)}$$

Where:

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation (1) using *ex post* monitored values (e.g. Q_y) (tCO_2e)
$PE_{y,ex\ post}$	Project emissions calculated using equation (2) using *ex post* monitored values (e.g. Q_y, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO_2e)
$LE_{y,ex\ post}$	Leakage emissions calculated using *ex post* monitored values (tCO_2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{y,transp,ex\ post}$	Emissions from incremental transportation based on monitored values in the year *y* (tCO_2e)
$PE_{y,power,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in

	the year *y* (tCO_2e)
$PE_{y,res\ waste,ex\ post}$	Methane emissions from the anaerobic decay/treatment of the residual waste/products based on monitored values in the year *y* (tCO_2e)
$PE_{y,phy\ leakage,ex\ post}$	Methane emissions from physical leakages of the anaerobic digester based on monitored values in year *y* (tCO_2e)

(a) In case of flaring/combustion MD_y will be measured using the conditions of the flaring process:

$$MD_y = BG_{burnt,y} * w_{CH4,y} * D_{CH4} * FE * GWP\_CH_4 \quad \textbf{(2)}$$

Where:

$BG_{burnt,y}$	Biogas[3] flared/combusted in year *y* (m^3)
$w_{CH4,y}$	Methane content[2] in the biogas in the year *y* (volume fraction)
D_{CH4}	Density of methane at the temperature and pressure of the biogas in the year *y* ($tonnes/m^3$)
FE	Flare efficiency in the year *y* (fraction). If the biogas is combusted for gainful purposes, e.g. fed to an engine, an efficiency of 100% may be applied

The project does not involve flaring.

Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider to apply the flare efficiency to the portion of the biogas used for energy, if separate measurements are not performed; When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy

All the biogas generates is used for thermal/electrical energy generation.

(b) Flow meters, sampling devices and gas analysers shall be subject to regular maintenance, testing and calibration to ensure accuracy;

All the flow meters and monitoring devices are calibrated once in 5 years as per CEA guideliens.

(c) **The monitoring plan should include on site inspections for each individual digester included in the project boundary where the project activity is implemented for each verification period.**

Baseline emissions

The baseline scenario is the situation where, in the absence of the project activity, biomass and other organic matter (including manure where applicable) are left to decay within the project boundary and methane is emitted to the atmosphere. The baseline emissions are the amount of methane emitted from the decay of the degradable organic carbon in the biomass and other organic matter. Baseline emissions

1. [3] Biogas and methane content measurements shall be on the same basis (wet or dry).

shall exclude emissions of methane that would have to be captured, fuelled or flared or gainfully used to comply with national or local safety requirement or legal regulations.

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

Where:

$BE_{SWDS,y}$	Where applicable, yearly methane generation potential of the solid waste anaerobically digested by the project activity during the year *x* from the beginning of the project activity (*x*=1) up to the year *y* estimated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" (tCO_2e). The tool may be used with the factor "f=0.0" assuming that no biogas is captured, flared or used. With the definition of year *x* as the base year since the project activity started diverting wastes from the SWDS/landfill site. *x* runs from the first year of the crediting period (*x*=1) to the year for which emissions are calculated (*x*=*y*). Where applicable, baseline emission determination of digested waste that would otherwise have been disposed in stockpiles shall follow relevant procedures in AMS-III.E
$BE_{manure,y}$	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 CH_4 (value of 21 is used)

$BE_{SWDS,y}$ **- Baseline emission due to methane generation from solid waste treatment is applicable. Tool under Emission from solid waste disposal site is used for calculation purposes[4]**

$$\left.\begin{matrix} BE_{CH4,SWDS,y} \\ PE_{CH4,SWDS,y} \\ LE_{CH4,SWDS,y} \end{matrix}\right\} = \varphi_y \cdot (1 - f_y) \cdot GWP_{CH4} \cdot (1 - OX) \cdot \frac{16}{12} \cdot F \cdot DOC_{f,y} \cdot MCF_y \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j (y-x)} \cdot \left(1 - e^{-k_j}\right) \quad (1)$$

The default factors used for the Baseline calculations

[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v8.0.pdf

Parameters			Unit
Amount of organic waste type j disposed/prevented from disposal in the SWDS in the year (t)	Wj,i	30.85	TPD
Model correction factor	ϕ y	1	
Oxidation factor		0.1	
	F	0.5	
Methane conversion factor	MCF	0.4	
	DOC j	15	
Fraction of degradable organic carbon (DOC) that decomposes under the specific conditions occurring in the SWDS for month m (weight fraction)	DOC f,y	0.5	
Decay Rate	k	0.4	
Fraction of methane captured	f	0.45	
Global warming potential	GWP	21	

Computation of Estimated Emission Reductions				
	Bio-Methanation Project			
Proposed Crediting Period	**Baseline Emissions**	**Project Emissions**	**Leakage Emissions**	**Emission Reductions**
	(tCO_{2e})	**(tCO_{2e})**	**(tCO_{2e})**	**(tCO_{2e})**
	3157	0	0	3,157
	5274	0	0	5,274
	6692	0	0	6,692
	7643	0	0	7,643
	8281	0	0	8,281
	8708	0	0	8,708
	8994	0	0	8,994
Total				**48,750**
			Average	**6,964**

$BE_{manure,y}$ **-Not applicable**

$BE_{ww,y}$ **-Not applicable**

$MD_{reg,y}$ **-Not applicable as no regulations in India**

Estimated total baseline emission reductions per year (BEy) = 6964 t CO2/Annum

Project Activity Emissions

Project activity emissions consist of:

(a) CO_2 emissions due to incremental transportation distances;

Not applicable as the distance of MSW treatment site from biodigester is less than landfill site

(b) CO_2 emissions from electricity and/or fossil fuel consumption by the project activity facilities;

Applicable

(c) 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;

The slurry is used as compost in garden and hence it is not applicable.

The following parameters shall be monitored and recorded annually during the crediting period:

- **Quantity of raw waste removed and quantity of compost produced ( );**
- **Quantity of oxygen consumed for high pressure aeration process, if applicable**
- **Transportation distance from compost yard to utilisation point**
- **Average truck capacity**

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

There is no leakage in anaerobic digester

(e) Methane emissions due to flare inefficiency;

The project activity does not involve flaring

$$PE_y = \begin{Bmatrix} PE_{transp,y} + PE_{power,y} + PE_{res\ waste,y} \\ + PE_{phy\ leakage,y} + PE_{flaring,y} \end{Bmatrix}$$

Hence PEy= PE power, y=0

For the calculation of project emissions from electricity and/or fossil fuel consumption by the project activity facilities ( ) all the energy consumption of all equipment/devices installed by the project activity shall be included e.g. energy used for chopping of biomass for size reduction and Tool to calculate the emission factor of an electricity system and/or "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" shall be followed, respectively. If recovered biogas is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor.

Leakage

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).

Monitoring
The emission reductions will be calculated as follows and the following monitoring requirements apply:

The emission reductions achieved by the project activity will be determined *ex post* through direct measurement of the amount of biogas fuelled, flared or gainfully used. It is possible that the project activity involves biomass treatment with higher methane conversion factor (MCF) than the MCF for the biomass which otherwise would have been left to decay in the baseline situation. Therefore the emission reductions achieved by the project activity is limited to the *ex post* calculated baseline emissions minus project and leakage emissions using the actual monitored data for the project activity (e.g. Q_y, and fossil fuels/electricity used). The emission reductions achieved in any year are the lowest value of the following:

$$ER_{y,ex\ post} = min\begin{bmatrix}(BE_{y,ex\ post} - PE_{y,ex\ post} - LE_{y,ex\ post}), (MD_y - PE_{y,power,ex\ post} - \\ PE_{y,transp,ex\ post} - PE_{y,res\ waste,ex\ post} - PE_{y,phy\ leakage,ex\ post} - LE_{y,ex\ post})\end{bmatrix}$$

$ER_{y,ex\ post}$	Emission reductions achieved by the project activity based on monitored values for year *y* (tCO_2e)
$BE_{y,ex\ post}$	Baseline emissions calculated using equation (1) using *ex post* monitored values (e.g. Q_y) (tCO_2e)
$PE_{y,ex\ post}$	Project emissions calculated using equation (2) using *ex post* monitored values (e.g. Q_y, transport distances, the amount of electricity/fossil fuels used, emissions from anaerobic storage). This calculation shall include project emissions from physical leakage (tCO_2e)
$LE_{y,ex\ post}$	Leakage emissions calculated using *ex post* monitored values (tCO_2e)
MD_y	Methane captured and destroyed or used gainfully by the project activity in year *y* (tCO_2e)
$PE_{y,transp,ex\ post}$	Emissions from incremental transportation based on monitored values in the year *y* (tCO_2e)
$PE_{y,power,ex\ post}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities based on monitored values in the year *y* (tCO_2e)
$PE_{y,res\ waste,ex\ post}$	Methane emissions from the anaerobic decay/treatment of the residual waste/products based on monitored values in the year *y* (tCO_2e)
$PE_{y,phy\ leakage,ex\ post}$	Methane emissions from physical leakages of the anaerobic digester based on monitored values in year *y* (tCO_2e)

MDy =0, as the project biogas is not flared.

Leakage, L=0

Emission Reduction =BEy =6946 t CO2/Annum

Estimated total baseline emission reductions per year (BEy)=6964 CoUs/year

B.6. Prior History>>

The project activity has not applied to any other GHG program for generation or issuance of carbon offsets or credits for the said crediting period.

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 Issuance Period: x years, x months – DD/MM/YYYY to DD/MM/YYYY

B.8. Monitoring plan>>

Data/Parameter	Q_y , $Q_{res\cdot waste,y}$
Data unit	Tonnes
Description	Quantity of solid waste treated in the digester
Source of data Value(s) applied	
Measurement methods and procedures	Daily and log book will be maintained
Monitoring frequency	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)
Purpose of data	For Baseline emission calculations

Data / Parameter:	$w_{CH4,y}$
Data unit:	%
Description:	Methane content in Biogas
Source of data:	Lab report
Measurement procedures (if any):	fraction of methane in the gas should be measured with a continuous analyser or, alternatively, with periodical measurements at a 90/10 confidence/precision level. It shall be measured using equipment that can directly measure methane content in the biogas - the estimation of methane content of biogas based on measurement of other constituents of biogas such as CO2 is not permitted. The methane content measurement shall be carried out close to a

	location in the system where a biogas flow measurement takes place
Monitoring frequency:	Monthly
QA/QC procedures:	-
Any comment:	Monitored as per AMS III H

Data / Parameter:	**T**
Data unit:	C
Description:	Temperature of Biogas
Source of data:	Log sheet
Measurement procedures (if any):	Using flow meter
Monitoring frequency:	Monthly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	P
Data unit:	Pa
Description:	Pressure of the biogas
Source of data:	Log sheet
Measurement procedures (if any):	Using flow meter
Monitoring frequency:	Monthly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	**CTy,CT residual waste,y**
Data unit:	Tonnes/truck
Description:	Average truck capacity for transportation
Source of data:	Log sheet
Measurement procedures (if any):	Using weighbridge on site
Monitoring frequency:	Daily
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	**DAF w,DAF res-waste**
Data unit:	Tonnes/truck
Description:	Average incremental distance for raw solid or product transportation
Source of data:	Log sheet
Measurement procedures (if any):	
Monitoring frequency:	Yearly
QA/QC procedures:	-

Any comment:	-

Data / Parameter:	**DAF w,DAF res-waste**
Data unit:	Tonnes/truck
Description:	Average incremental distance for raw solid or product transportation
Source of data:	Log sheet
Measurement procedures (if any):	
Monitoring frequency:	Yearly
QA/QC procedures:	-
Any comment:	-

Data / Parameter:	**Auxiliary electricity consumption**
Data unit:	MWh
Description:	Auxiliary electricity consumption from grid
Source of data:	Log sheet
Measurement procedures (if any):	Continuous with energy meters
Monitoring frequency:	Monthly
QA/QC procedures:	As per CEA
Any comment:	