



# PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT



**Title: Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra**

Version 1.0

**Date of PCN Report: 23/06/2022**

**First CoU Issuance Period: 8 Years, 0 Months**

**Crediting Period: 01/01/2014 to 31/12/2021**



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

BASIC INFORMATION

Title of the project activity	<b><u>Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra</u></b>
Scale of the project activity	Small Scale
Completion date of the PCN	23/06/2022
Project participants	<u>Project Proponent</u> : Gram Panchayat Tiroda <u>UCR Aggregator</u> : Progressive Management Consultants
Host Party	India
Applied methodologies and standardized baselines	AMS.I.E. Switch from non-renewable biomass for thermal applications by the user (Ver 12.0) UCR Biogas Protocol Standard Baseline
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources)
Estimated amount of total GHG emission reductions per year	<b>1696</b> CoUs /year ( <b>1696</b> tCO <sub>2eq</sub> /yr)
Estimated amount of total GHG emission reductions over the crediting period	<b>13568</b> CoUs ( <b>13568</b> tCO <sub>2eq</sub> )

## SECTION A. Description of project activity

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

The project **Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra** is located in Village: Tiroda, Zilla: Sindhudurg, Taluka: Sawantwadi, State: Maharashtra, India.

The project results in reductions of CO<sub>2</sub> emissions that are real, measurable and give long-term benefits to the mitigation of climate change. Emission reductions attributable to the project are included in the *UCR Positive List of Project Types* deemed to be additional and also meet the “Do No Net Harm to Society and Environment” criteria under the **UCR CoU Standard**.

The details of the registered project are as follows:

#### Purpose of the project activity:

The **Tiroda Small Scale Biogas Projects, Sawantwadi, Maharashtra** is located in the rural village of Tiroda and setup by the Gram Panchayat Tiroda (Project Proponent-PP).

The purpose of the project activity is the set up of 260 independent biogas plants (digesters) of capacities between 2m<sup>3</sup> and 9m<sup>3</sup> capacity each for serving individual households comprising of an average of 4 members each, using cattle dung collected from buffaloes, cows and calves currently being housed at such rural households in the village of Tiroda. The technology involves the construction of foundation, dome, Biogas outlet pipe, inlet mixer tank and outlet tank into which the animal manure mixed with water for the production of biogas. Through a series of biochemical reactions, the organic matter is broken down by mesophilic microorganisms to release biogas, of which methane is the major component. The biogas is released into the pipes connected to the stoves when the stove burner is switched on. The technology to be employed is environmentally safe and sound. The project activity is implemented in a phase wise manner since 01/01/2002.

The average family size per household is 4 persons (as per the data table below).

HOUSELISTING & HOUSING CENSUS, 2011													
State Code	State Name	District Code	District Name	Area Name	Rural/ UrbanRural/ UrbanRural/ UrbanRural/ UrbanRural/	Census Year	Household size						
							1	2	3	4	5	6-8	9+
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Total	2011	4.4	9.1	16	30.8	18	19	2.7
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Rural	2011	6.6	8.9	14	28.7	19.8	19	3.1
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Urban	2011	0.7	9.5	19.6	34.5	14.9	18.9	2

Each household has installed the biogas plant outside their household and feeds cattle dung into the anaerobic digester. The technology is tried and tested in India, and has been in use for many years. By utilizing cattle dung in a controlled anaerobic digestion and combustion system, biogas is available for cooking energy and heat water for bath. Biogas is used on a single ring gas stove having one 4” burner with a flame temperature of 870 ° C, supplied as part of the project activity. The biogas slurry is used as bio-manure.

By using biogas generated from cattle dung, the project activity replaces Non-Renewable Biomass with biogas for cooking and heating water (as per the data table below). The baseline scenario is thermal energy from fuel wood within the domestic households in the village of which a large part of it was non-renewable for domestic cooking and water heating.

HOUSELISTING & HOUSING CENSUS, 2011															
State Code	State Name	District Code	District Name	Area Name	Rural/Urban/Rural/Urban/Rural/Urban	Census Year	Household	Type of Fuel used for Cooking							Cooking inside house:
								1	Fire-wood %	Crop residue	Cowdung cake	Coal/Lignite/Charcoal	Kerosene	LPG/PNG	
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Total	2011	4.4	63.5	1	0.7	0	3	31	94.3	
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Rural	2011	6.6	84.1	0.8	0	0	1.2	13.6	93.8	
27	MAHARASHTRA	529	Sindhudurg	Sub-District - Sawantwadi	Urban	2011	0.7	27.7	1.4	2	0	6.1	61.5	95.3	

This project activity contributes strongly to sustainable development of the rural households involved in the project. A biogas plant of 2 m<sup>3</sup> capacity is sufficient to provide cooking fuel to a four household family with four to five members each. Fuel wood scarcity has an impact directly on rural households, which are highly dependent on this fuel. Demand for fuel wood and logs from commons and forests have caused resource degradation to the extent that collection exceeds sustainable yield. The project activity will attenuate the rural thermal energy needs used for cooking and water heating. The percentage of population using fuel wood is higher in rural areas (67.3%) and 14% in urban and semi-urban areas (NSSO, 2012).

**Table 3: Trends of forest resources as reported in India's State of Forest Reports (ISFR)**

Forest resource accounting variable	ISFR 2003	ISFR 2005	ISFR 2009	ISFR 2011	ISFR 2013	ISFR 2015	ISFR 2017	Net Change between 2003 to 2017	% change between 2003 to 2015
Forest Cover (in square kilometres)	686,767	692,027	6,90,899	6,92,027	6,97,898	7,01,673	7,08,273	20,506	3.13
Growing Stock in Forests (million cubic meters)	4781.414	4602.04	4498.7	4498.73	4173.36	4195.047	4218.38	-563.034	-11.78
Growing Stock in Forests and Tree outside forests (million cubic meters)	6413.752	6218.28	6098.2	6047.15	5658.05	5768.387	5822.377	-591.373	-9.22

[https://www.un.org/esa/forests/wp-content/uploads/2018/04/UNFP13\\_Background\\_Note\\_Wood\\_Energy\\_in\\_IndiaTERI.pdf](https://www.un.org/esa/forests/wp-content/uploads/2018/04/UNFP13_Background_Note_Wood_Energy_in_IndiaTERI.pdf)

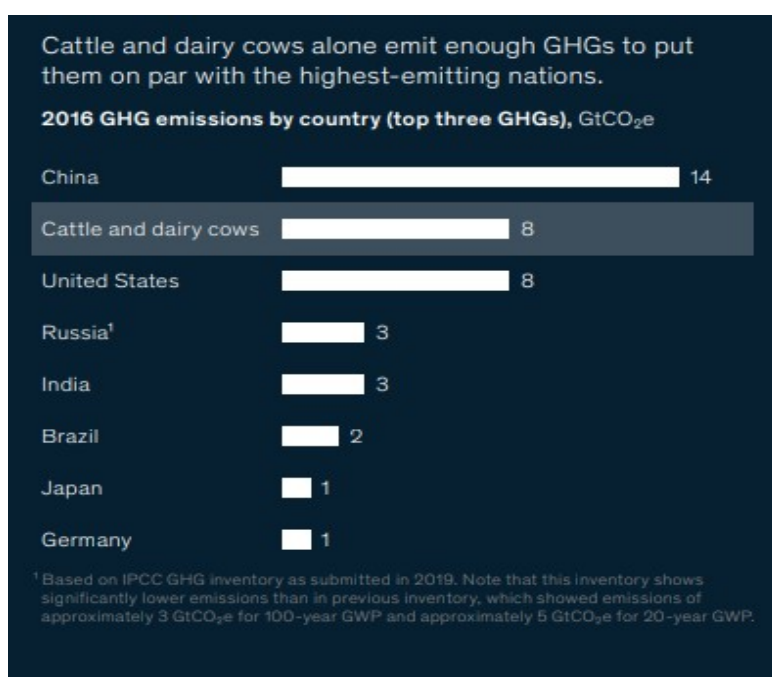
Source: FSI 2003; FSI, 2005; FSI 2009; FSI 2011; FSI 2013; FSI 2015; FSI 2017

Fuel wood is largely used by women for cooking purpose and they approximately spends more than 374 hours in a year for collecting fuel wood. The fuel wood is collected from forests, trees grown on farm lands, homesteads and common land outside forest. The annual fuel wood consumption by 854 million people in India is 216.4 million tonnes per year (FSI, 2011). Around 27% of fuel wood is collected from Government owned forests (Public Land). The smoke from burning such fuels causes alarming household pollution and adversely affects the health of women & children causing several respiratory diseases/ disorders. Biogas technology is a particularly useful system in the Indian rural economy, and can fulfill several end uses. The gas is useful as a fuel substitute for firewood, dung, agricultural residues, petrol, diesel, and electricity, depending on the nature of the task, and local supply conditions and constraints, thus supplying energy for cooking and lighting.

Biogas systems also provide a residue organic waste after anaerobic digestion that has superior nutrient qualities over the usual organic fertilizer, cattle dung, as it is in the form of ammonia. Anaerobic digesters also function as a waste disposal system, particularly in curbing methane emissions from cattle dung which is stockpiled and untreated in most villages.

Livestock production can result in methane (CH<sub>4</sub>) emissions from enteric fermentation and both CH<sub>4</sub> and nitrous oxide (N<sub>2</sub>O) emissions from livestock manure management systems. Cattle are an important source of CH<sub>4</sub> in many countries because of their large population and high CH<sub>4</sub> emission rate due to their ruminant digestive system.

Methane emissions from manure management tend to be smaller than enteric emissions, with the most substantial emissions associated with confined animal management operations where manure is handled in liquid-based systems. The conventional method of handling manure has been to use sufficient bedding to keep the manure relatively dry and then to move it out of the confinement area and deposit it into a manure pile for months prior to the project activity.



Due to constraints associated with manure management, feeding, breeding, health and management, the Indian dairy sector is one of the most greenhouse gas (GHG) emission intensive sector in the country. The typical manure management system across India involves manure stacking in piles prior to dung cake making.

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

As per the Schedule 1 of the EIA notification 2006, given by the Ministry of Environment and Forests under the Environment (Protection) Act 1986, the project activity doesn't fall under the list of activities requiring EIA.

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

- **Social benefits:**

- Reduces drudgery to women and children who spend long hours and travel long distances to collect fuel wood.
- Reduces indoor air pollution, thus eliminating health hazards for women and children.
- The project provides security of energy supply
- It leads to better manure management thus keeping the surroundings clean and reduce some of the disease causing pathogens
- Children are able to attend school in time as food will be cooked in time.
- An important point that should be stressed upon here is the involvement of men folk in carrying the dung to the digester. Thus, this model of biogas plant reduces the efforts required to be put in by women, who in other cases are alone responsible for the operation and maintenance of collection of firewood for traditional cooking methods.

- **Environmental benefits:**

- Improves the local environment by reducing uncontrolled deforestation in the project area. Fuel wood collection and consumption are intricately linked to degradation of natural resource management. Demand for fuel wood from commons and forests cause resource degradation.
- 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 non-renewable biomass to renewable energy, leading to reduction of GHG emissions
- Reduces deforestation, reduces indoor air pollution, and increases use of manure rather than chemical fertilizers.
- Using biogas as an energy resource contributes to clean environment. Cattle dung is transformed into high-quality enriched bio-manure/fertilizer.
- Hygienic conditions are improved through reduction of pathogens by utilizing the animal and other organic wastes in the bio-digesters.
- The high-quality manure produced will lead to improvement in soil conditions.
- A clean and particulate-free source of energy also reduces the likelihood of chronic diseases that are associated with the indoor combustion of biomass-based fuels, such as respiratory infections, ailments of the lungs; bronchitis, asthma, lung cancer, and increased severity of coronary artery disease.
- 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:**

- Higher productivity of family members as they have adequate cooking fuel supply

- Provides employment to local communities through construction and maintenance of biogas units.
- The project reduces cooking time, thus providing the three households to take up income generating activities like farming and other compost related sale activities.
- A regular supply of energy piped to the home reduces, if not removes, the daily task of fuelwood gathering, which can, in areas of scarcity, be the single most time consuming task of a woman's day - taking more than three hours in some areas. Freeing up energy and time for a woman in such circumstances often allows for other activities, some of which may be income generating.

### A.3. Location of project activity >>

Country: India.

Village: Tiroda

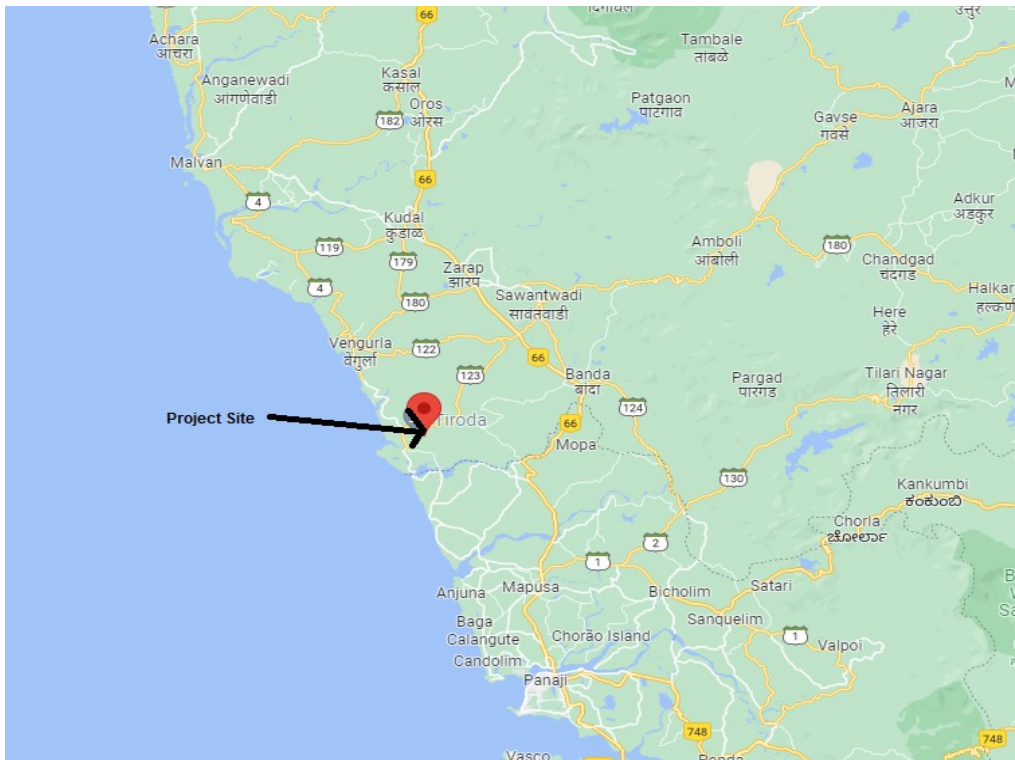
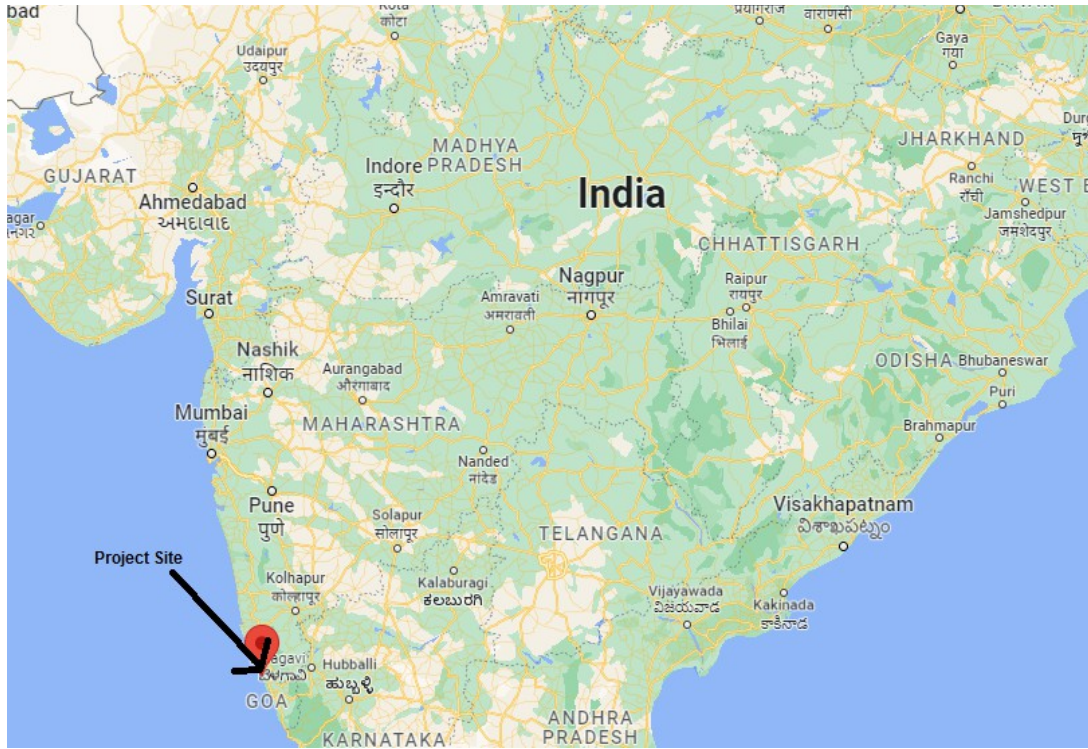
District: Sawantwadi

Taluka: Sindhudurg

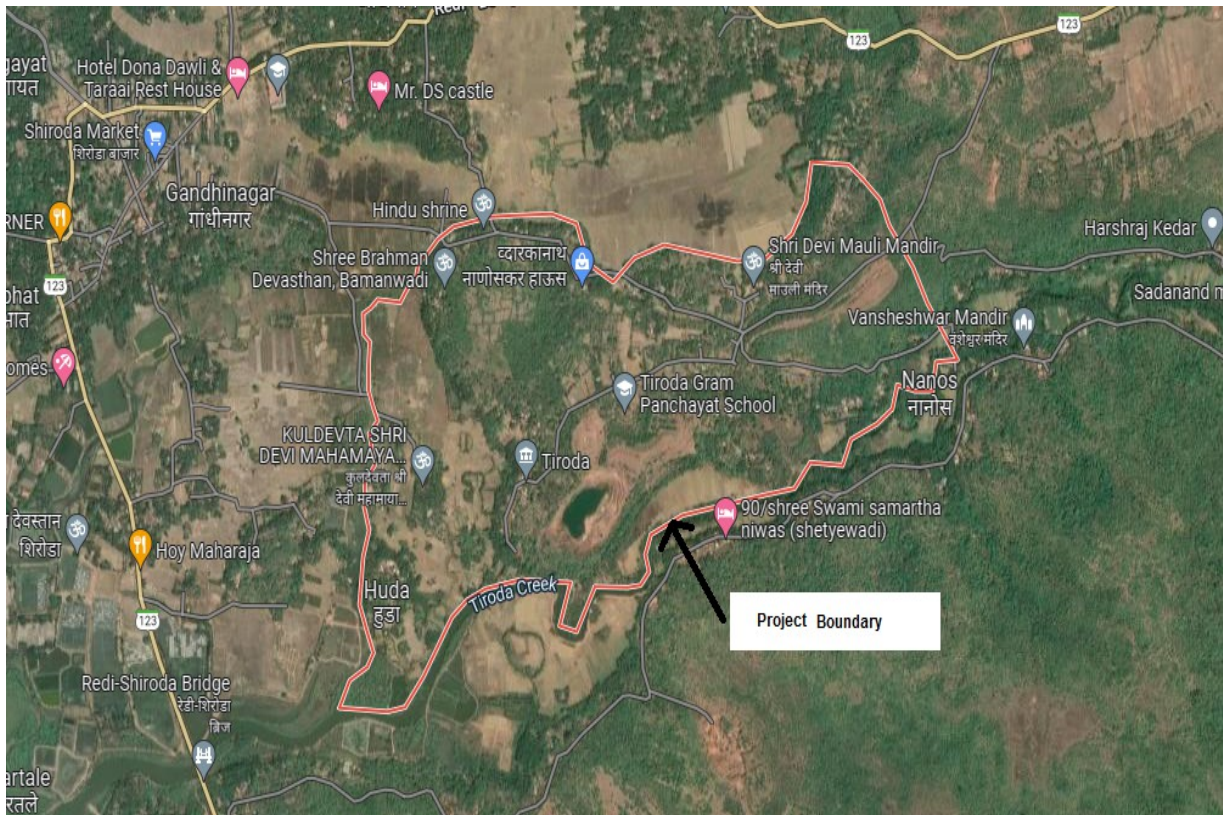
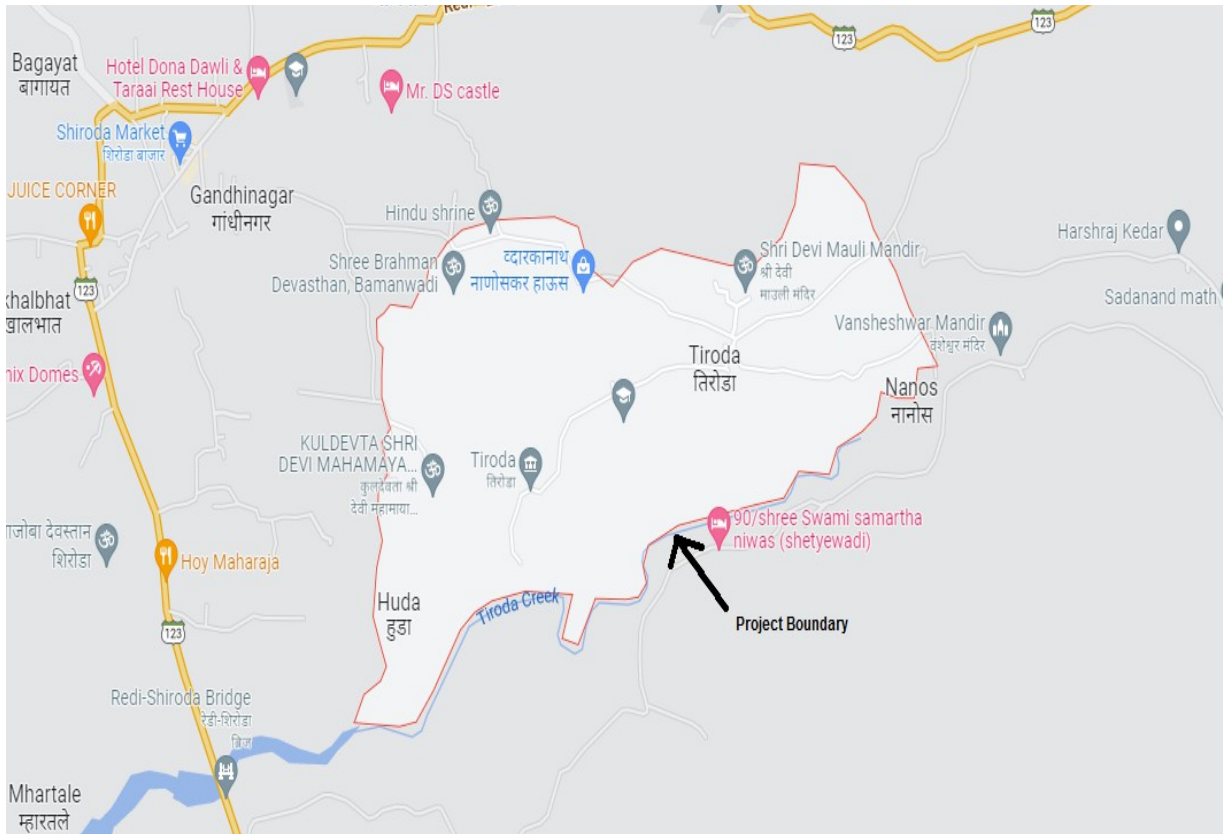
State: Maharashtra

Latitude: 15° 45' 46.584" N

Longitude: 73° 41' 47.976" E







#### A.4. Technologies/measures >>

A total of 260 biogas digesters have been installed since 01/01/2002, having capacity of 2m<sup>3</sup> and 9m<sup>3</sup> each. All households within the project activity possess cattle or other bovine animals, the number of cattle at each household ranges from 2-6.

The animal stalls are in the front yard/backyard/porch of the household in most of the cases. The animals are allowed to graze in the free pastures of the village or in some cases fed in the stall itself. One cow produces around 10-12 kg cow dung per day. Before the establishment of the biogas plant, this cow dung used to be dried and processed into dung cakes which were then used to fuel gohar chullas or sold annually to external contractors.



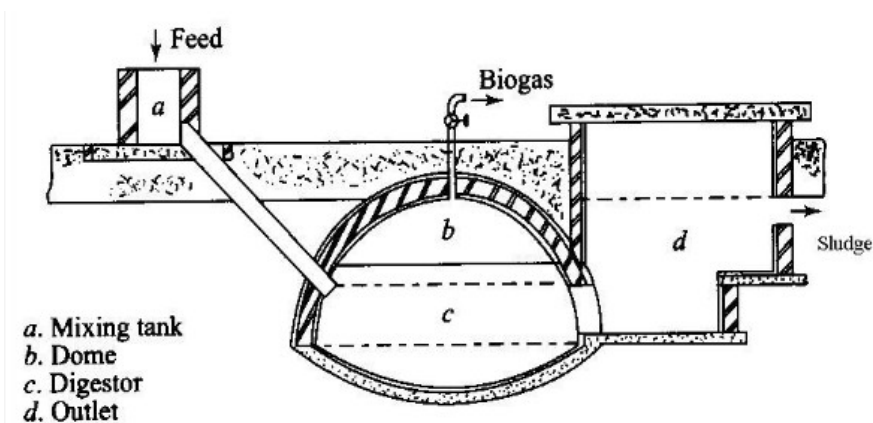
The idea of the biogas digester was triggered in order to have a proper disposal system for the cow dung. Before the establishment of biogas plants, the dung would be collected in households, streets, empty spaces and left there itself till it was sold to some external contractor. The contractor would collect the dung once in a year which resulted in dung being piled up in large quantities. This was an unhygienic practice and raised health concerns.

Biogas is a mixture of methane and carbon dioxide. It also has traces of hydrogen sulphide (3%), ammonia, oxygen, hydrogen, water vapour etc., depending upon feed materials and other conditions. Biogas is generated by fermentation of cellulose rich organic matter under anaerobic conditions. In anaerobic conditions, the methane-producing bacteria become more active. Thus, the gas produced becomes rich in methane.

Capacity m <sup>3</sup>	No of Digestors
2	1
3	11
4	24
5	60
6	80
7	78
8	2
9	4
Total	<b>260</b>

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.

Deenbandhu model was developed in 1984, by Action for Food Production (AFPRO), a voluntary organization based in New Delhi. The Deenbandhu biogas plant has a hemispherical fixed-dome type of gas holder, unlike the floating dome of the KVIC-design. The dome is made from pre-fabricated ferrocement or reinforced concrete and attached to the digester, which has a curved bottom. The slurry is fed from a mixing tank through an inlet pipe connected to the digester. After fermentation, the biogas collects in the space under the dome. It is taken out for use through a pipe connected to the top of the dome, while the sludge, which is a by-product, comes out through an opening in the side of the digester. About 90 percent of the biogas plants in India are of the Deenbandhu type.



Schematic diagram of a Deenabandhu biogas plant

The technical specifications of the Deenbandhu model bio-digesters are as follows:

Specification	Value
Total installed capacity	1509 m <sup>3</sup>
Mixing Proportion	(Water: Dung) 1:1
Number of units (digesters)	260
Feed Material	Cattle Dung
Biogas Flow rate	0.9 m <sup>3</sup> /hr
Number of Stoves	1 per household
Unit Conversion rate MJ -> kWh	0.28
Efficiency of Burners	60.00%
Calorific Value Biogas	22.1 MJ/m <sup>3</sup> Source: Nijajuna, B. T. (2002): Biogas Technology. New Age International Publishers. New Delhi.
Rated Capacity (thermal) MW <sub>thermal</sub>	0.86 MW <sub>th</sub>





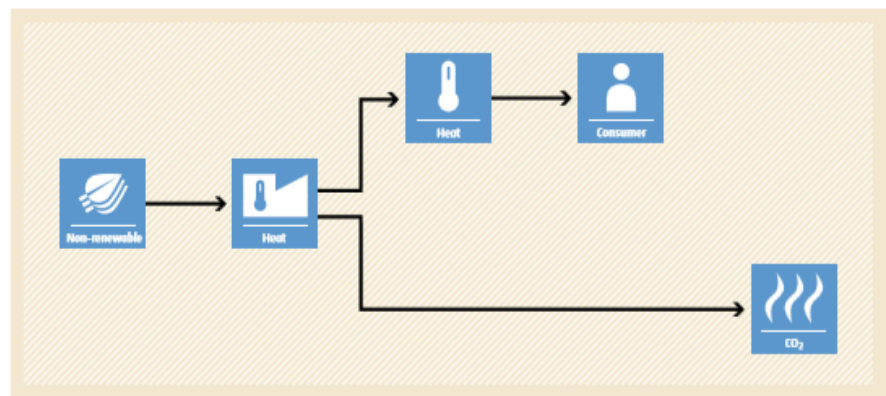
#### A.5. Parties and project participants >>

Party (Host)	Participants
India	PP: Tiroda Gram Panchayat <u>UCR Aggregator</u> : Progressive Management Consultants <u>UCR #</u> 110736904

## A.6. Baseline Emissions>>

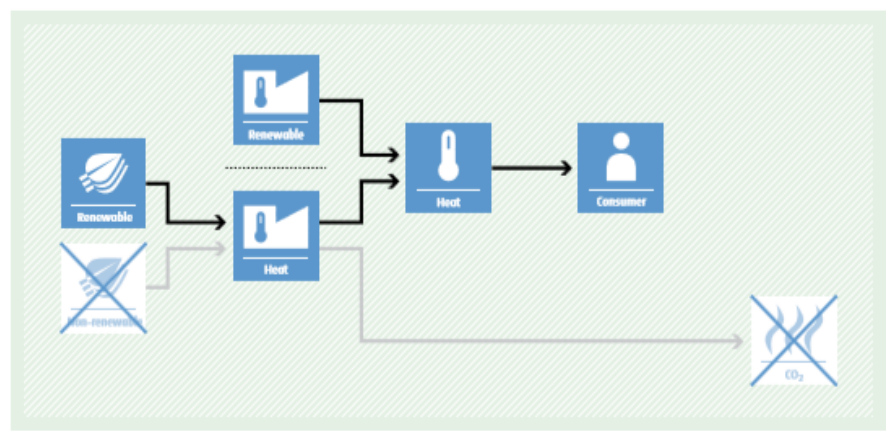
### BASELINE SCENARIO

Thermal energy would be produced by more-GHG-intensive means based on the use of non-renewable biomass.



### PROJECT SCENARIO

Use of renewable energy technologies for thermal energy generation, displacing non-renewable biomass use.



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

- thermal energy from more GHG intensive means based on the use of non-renewable biomass for domestic cooking and water heating.

As per the Population Census 2011, there were total 292 families residing in the village Tiroda. The total population of Tiroda is published as 1,204. All these biogas digesters within the project activity are a voluntary investment which replaced equivalent amount of thermal energy from renewable source, the biogas. The project proponents are not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace thermal energy from fuel wood and fight the impacts of climate change.

The Project Proponent hopes that carbon revenues from 2014-2021 accumulated as a result of carbon credits generated will help repay the loans and/or in the continued maintenance of this project activity, including upgrades as applicable. The rural households across India are primarily dependent on fuel wood for cooking and heating water. Further, when complications have arisen in the functioning of plants, a common complaint articulated is that there is a lack of available technical support. In this way, digesters are allowed to fall into disrepair, when their functioning depends upon adequate maintenance skills, which should be available in every village. There is a danger that biogas may come to be thought of as a useless and inappropriate initiative.

Fuel usage correlates with income levels and lower income households tend to use more fuelwood

as cost is still a barrier for use of LPG in rural areas. All the households were still using fuelwood as the dominant fuel for cooking and heating water for bath on inefficient mud/clay wood stoves that do not have chimney and grate.

Majority of the firewood users believe that cooking with this fuel improved their financial wellbeing because selling firewood generated income, whilst collecting the fuel gave them an opportunity to socialise and is a tradition they would like to continue. They viewed LPG as a financial burden that gave food an undesirable taste and feared a fatal canister explosion. This shows that though LPG has been provided with subsidy to the rural communities, the refill is very expensive and rural households are still using traditional stove for cooking. Easy availability of biomass, affordability and concerns of safety issues deter households from adopting LPG and continue using fuelwood. The region is scarce of biomass and non-renewable biomass is part of the biomass used for cooking and heating water.

#### **A.7. Debundling>>**

This project activity 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 Energy industries (Renewable/Non-renewable sources)

**TYPE I** - Renewable Energy Projects

**CATEGORY-** *AMS. I.E. Switch from Non-Renewable Biomass for Thermal Applications by the User (Ver.12.0)*

This methodology comprises of activities to displace the use of non-renewable biomass by introducing renewable energy technologies to households, communities, and/or institutions such as schools, prisons or hospitals (hereinafter referred as end-users). Examples of these technologies include, but are not limited to :

**Biogas stoves.**

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

The project activity is biogas cook stove for households and provides thermal energy from cattle dung that is renewable. It replaced the baseline technology mud/clay, three-stone traditional cook stove that used non-renewable biomass at the household level. The biogas produced is also used for captive power generation. All biogas units are between 2m <sup>3</sup> and 9m <sup>3</sup> capacity and distinct from each other.
Biogas produced by the digesters are used or flared.
The annual average temperature of the biogas site is located is higher than 5°C
The storage time of the manure after removal from the animal barns, including transportation, does not exceed 45 days before being fed into the digesters.
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 residual waste from the animal manure management system is handled aerobically.
The communities across India are using non-renewable biomass since 31st December 1989. This is based on using published literature, official reports and statistics.
The project activity does not use renewable biomass. The renewable source is cattle dung.
The project activity is biogas cook stove and is not electric cook stoves.
There is a technology switch from traditional stove to biogas stove.
This is a small scale project with total thermal capacity of 0.86 Mw <sub>th</sub> which is not greater than the small scale thresholds defined by the applied methodology I.E. the limit of 45 MW <sub>th</sub> is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves)".

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

Each of the biogas unit is constructed by the PP close to the household. Each biogas unit has a unique ID, which is visible on the biogas unit. The Monitoring Report has the details of the end user's name and the location in which it is constructed along with the Unique ID.

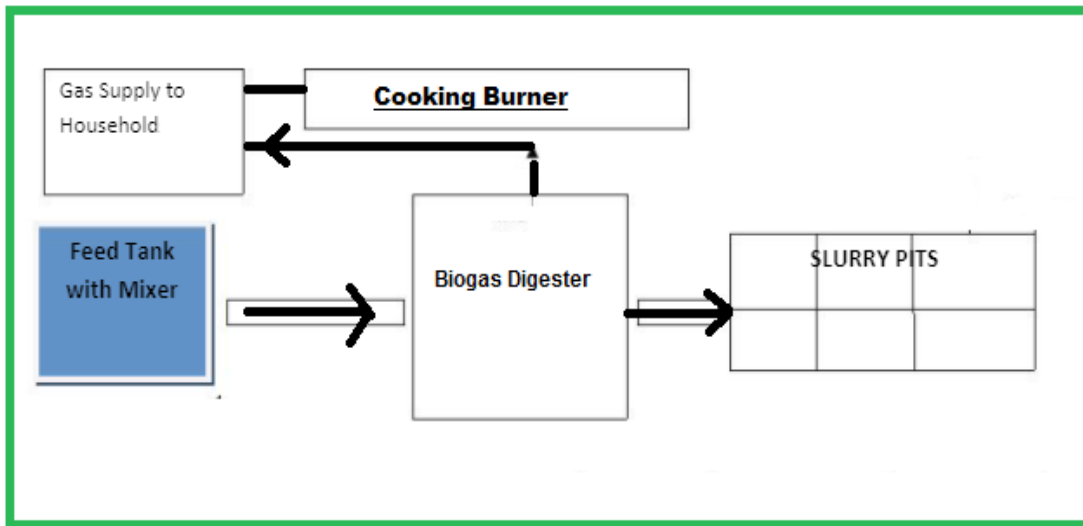


#### B.4. Project boundary, sources and greenhouse gases (GHGs)>>

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

- Biogas digesters;
- Households using biogas for heating and cooking

Project Boundary



	Source	GHG	Included?	Justification/Explanation
Baseline	Emissions from burning non-renewable wood	CO <sub>2</sub>	<b>Included</b>	Major source of emission
		CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative
Project Activity	Combustion of renewable biogas for cooking	CO <sub>2</sub>	Excluded	Heat is generated from collected biogas, hence these emissions are not accounted for. CO <sub>2</sub> emissions from the decomposition of organic waste are not accounted
	Emissions from residue from anaerobic digester	CH <sub>4</sub>	Excluded	Excluded for simplification. This is conservative
		N <sub>2</sub> O	Excluded	Excluded for simplification. This is conservative

Leakage Emissions is not applicable as the project cook stove is not switching to charcoal or processed renewable biomass.

## B.5. Establishment and description of baseline scenario (UCR Protocol) >>

The baseline scenario is thermal energy from more GHG intensive means based on the use of non-renewable biomass for domestic cooking and water heating. Thus, this project activity was a voluntary investment which replaced equivalent amount of thermal energy from renewable source, the biogas. The baseline emission boundary is site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for producing thermal energy and applies this methodology on a standalone basis, i.e. without using a Type III component of a SSC methodology.

The project proponents are not bound to incur this investment as it was not mandatory by national and sectoral policies. Thus, the continued operation of the project activity would continue to replace thermal energy from fuel wood.

The CoUs or emission reductions for small-scale biogas units are based on approved fossil fuel emission displacement rates established by the UCR Biogas Protocol. These rates have taken into account the size of the biogas unit, fossil fuel displaced and size of a household.

1-2 cubic meter	3 cubic meter	4 cubic meter	5 cubic meter	>5 cubic meter
3.5 CoUs/year	4.5 CoUs/year	5.3 CoUs/year	5.5 CoUs/year	Biogas units that have a capacity above 5 cubic meters that follow this UCR Protocol will be credited at the 5 cubic meters rate

**Estimated Annual Emission Reductions:**  $BE_y = HG_{y,thermal} \times EF_{FF,CO_2}$

$BE_y$  = Emission reductions from the use of non-renewable biomass as per the UCR protocol in a year y.

where:

$HG_{y,thermal}$  = Total thermal capacity of the number of digesters in year y

$EF_{FF,CO_2}$  = CO<sub>2</sub> emission factor of the fossil fuel displaced in the baseline as determined by the UCR Standard.

$GWP_{CH_4} = 21$  is the default IPCC value of CH<sub>4</sub> applicable to the crediting period (tCO<sub>2e</sub>/t CH<sub>4</sub>)

$NCV_{CH_4}$  = NCV of methane (MJ/Nm<sup>3</sup>) (default value: 35.9 MJ/Nm<sup>3</sup>)

$NCV_{biomass}$  = Net calorific value of the non-renewable biomass as per UCR Standard (0.015 TJ/tonne )

**Estimated total baseline emission reductions per year ( $BE_y$ ) = 1696 CoUs/yr (1696 tCO<sub>2e</sub>/yr)**

**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 Issuance Period: 8 years, 0 months – 01/01/2014 to 31/12/2021

**B.8. Monitoring plan>>**

The various parameters that need to be monitored as described in the UNFCCC CDM methodology are:

- (i) Biogas units constructed
- (ii) Number of biogas plants operating
- (iii) Non-usage days of biogas plants
- (iv) Confirmation that non-renewable biomass has been substituted

The timeline of construction of the units is monitored and database maintained by the PP. Each biogas unit is marked with the unique ID number. All necessary data is archived and stored throughout the crediting period and is available for review with the PP.

Data / Parameter:	$f_{nrb}$
Data unit:	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Description:	Determination of the share of NonRenewable woody biomass
Source of data:	UCR Standard
Measurement procedures (if any):	Fixed
Monitoring frequency:	-
QA/QC procedures:	-
Any comment:	-

Data/Parameter	Number of Functional digesters
Data unit	N
Description	Number of functional digesters in households in the project activity in year y
Source of data Value(s) applied	Monitoring Report As and when commissioned
Measurement methods and procedures	The repair and maintenance sheets are maintained from its initiation to completion dates for the biogas unit. Though the methodology requires monitoring this parameter biennially, it is done on a day to day basis. This is to ensure regular energy supply to the rural households through continuous monitoring and

	immediate repairs to decrease downtime.
Monitoring frequency	In the village, the PP is the monitoring agency entrusted with repairing the biogas units that are non-operational. The days other than that non-operational will determine the biogas units which are operational.
Purpose of data	To estimate baseline emissions

Data/Parameter	$B_y$
Data unit	tonnes/household/year
Description	Average annual consumption of woody biomass per household in the project before the project activity.
of data Value(s) applied	UCR Standard Protocol As per Standard
Measurement methods and procedures	Fixed
Monitoring frequency	NA
Purpose of data	To estimate baseline emissions

## Sampling Design

The sampling method chosen for the project area is simple stratified random sampling as the target population is homogeneous in nature. A simple random sample is a subset of a population chosen randomly, such that each biogas of the population has the same probability of being selected. The sample-based estimate of mean is an unbiased estimate of the population parameter. It is also easy to implement as the sampling frame (household details for which biogas has been implemented) is collected and stored in the PP database.