PROJECT CONCEPT NOTE

CARBON OFFSET UNIT (CoU) PROJECT

Title: Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala

Version 1.0
Date of PCN Report: 18/01/2023

1st Monitoring Period: 01/01/2013 to 31/12/2022, 10 Years, 0 Months
1st Crediting Period: 01/01/2013 to 31/12/2022, 10 Years, 0 Months

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

BASIC INFORMATION	
Title of the project activity	**Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala**
Scale of the project activity	Small Scale
Completion date of the PCN	18/01/2023
Project participants	Project Proponent: The Andhyodaya, Ernakulam, Kerala, India.
Host Party	India
Applied methodologies and standardized baselines	AMS.I.I. Biogas/biomass thermal applications for households/small users (Ver.06) UCR Biogas Protocol Standard Baseline
Sectoral scopes	01 Energy industries (Renewable/NonRenewable Sources)
SDG Impacts:	1 – SDG 1 No Poverty 2 – SDG 3 Good health and well being 3 – SDG 7 Affordable and Clean energy 4 – SDG 8 Decent work and economic growth 5 – SDG 13 Climate Action 6 – SDG 15 Life on Land 7 – SDG 17 Partnerships for the goals
Estimated amount of total GHG emission reductions per year	**45978** CoUs /year (**45978** tCO_{2eq}/yr)
Estimated amount of total GHG emission reductions over the 1st crediting period	**459780** CoUs (**459780** tCO_{2eq})

SECTION A. Description of project activity

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

The project activity- **Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala** is located in State: Kerala, Country: India.

The following are the locations based on District/Villages:

District	Village	District	Village	District	Village
Ernakulam	Aarakuzha	Ernakulam	Amballoor	Ernakulam	Asamannoor
Kannur	Aaralam	Thiruvananthapuram	Amboori	Kottayam	Athirampuzha
Ernakulam	Aavoly	Palakkad	Anakkara	Thiruvananthapuram	Athiyanoor
Ernakulam	Aayavana	Pathanamthitta	Angadi	Kozhikode	Athiyodi
Kannur	Achankkunnu	Ernakulam	Angamaly	Thiruvananthapuram	Attingal
Idukki	Adimali	Malappuram	Anghadipuram	Ernakulam	Avoly
Palakkad	Agali	Pathanamthitta	Anikad	Idukki	Avoly
Malappuram	Aghampadam	Thrissur	Annamanada	Palakkad	Ayaloor
Ernakulam	Aikaranad	Thrissur	Anthikkadu	Kannur	Ayamkunnu
Kottayam	Akalakkunnam	Ernakulam	Arakkuzha	Kottayam	Ayarkunnam
Kannur	Alackode	Idukki	Arakulam	Ernakulam	Ayavana
Idukki	Alackode	Ernakulam	Arakuzha	Idukki	Ayavana
Thrissur	Alagappanagar	Kannur	Aralam	Pathanamthitta	Ayroor
Kannur	Alakodu	Wayanad	Aralam	Kannur	Ayyakunnu
Idukki	Alappara	Ernakulam	Aralam	Ernakulam	Ayyambuzha
Alappuzha	Alappuzha	Kozhikode	Areecode	Kannur	Ayyamkunnu
Kollam	Alayaman	Kozhikode	Areekulam	Wayanad	Ayyamkunnu
Malappuram	Alipparambu	Kannur	Arelam	Ernakulam	Ayyampuzha
Alappuzha	Alla	Kozhikode	Arikkulam	Kannur	Ayyangunnu
Thrissur	Aloor	Thrissur	Arimboor	Ernakulam	Ayyanpuzha
Wayanad	Alpuzha	Thiruvananthapuram	Ariyanad	Idukki	Ayyappancovil
Malappuram	Amarambalam	Alappuzha	Aroor	Wayanad	Ayyappankovil
Wayanad	Ambalabvayal	Kottayam	Arpukkara	Idukki	Ayyappankovil
Alappuzha	Ambalappuzha	Thiruvananthapuram	Aruvikkara	Kannur	Azhakode
Wayanad	Ambalavayal	Alappuzha	Aryadu	Idukki	Baison Valley
Thrissur	Chalakkudy	Thiruvananthapuram	Aryankode	Kasaragod	Balal
Malappuram	Chaliyar	Thrissur	Chelakkara	Thiruvananthapuram	Balaramapuram

Kozhikode	Chaliyar	Thrissur	Chelakkara	Kozhikode	Ballussery
Kannur	Changalai	Thrissur	Chelakkara	Kasaragod	Bandadukka
Kozhikode	Changaroth	Thrissur	Chelakkara	Kottayam	Barananganam
Kannur	Chapparapadave	Thrissur	Chelakkara	Wayanad	Batheri
Kozhikode	Chathamangalam	Kozhikode	Chelannoor	Kottayam	Bharananganam
Kozhikode	Chathamangalam	Kozhikode	Chelannoor	Alappuzha	Budanoor
Kozhikode	Chathamangalam	Kozhikode	Chelannoor	Kozhikode	Calicut
Kollam	Chathannoor	Kozhikode	Chelannoor	Idukki	Chackupallam
Pathanamthitta	Ezhumattur	Kozhikode	Chelannoor	Kollam	Chadayamangalam
Alappuzha	Ezhupunna	Malappuram	Chelembra	Kozhikode	Chakitappara
Idukki	Iduky Kanjikuzhi	Malappuram	Chelembra	Idukki	Chakkapalam
Idukki	Irattayar	Kannur	Chembalayi	Thiruvananthapuram	Chenkal
Thrissur	Chelakkara	Kasaragod	Chemmanad	Alappuzha	Chennampallipuram

Palakkad	Erimayoor	Kannur	Chengalai	Pathanamthitta	Chenneerkara
Kannur	Erumam	Kannur	Chengalayi	Alappuzha	Chennithala
Thrissur	Erumappetty	Ernakulam	Chengamanad	Wayanad	Cheramkodu
Kottayam	Erumelly	Kozhikode	Chengarothu	Ernakulam	Cheranalloor
Kannur	Eruvassery	Kozhikode	Chengattukavu	Alappuzha	Cheriyanad
Kollam	Ettiva	Kannur	Earamamkavoor	Kozhikode	Cherode
Kottayam	Ettumannur	Thrissur	Earyadu	Alappuzha	Cherthala
Kannur	Ezhom	Kasaragod	East Elari	Malappuram	Cherukavu
Kollam	Kadakkal	Kannur	East elary	Pathanamthitta	Cherukol
Alappuzha	Kadakkarappally	Kollam	East Kallada	Kannur	Cherupuzha
Kasaragod	Kadam beloor	Malappuram	Edakkara	Kasaragod	Cherupuzha
Ernakulam	Kadamakkudy	Ernakulam	Edakkattuvayal	Kozhikode	Cheruvannoor
Palakkad	Kadambazhyppuram	Malappuram	Edapal	Thiruvananthapuram	Chillimanoor
Kottayam	Kadanad	Ernakulam	Edathala	Idukki	Chinnakanal
Thrissur	Kadangottu	Ernakulam	Edathala	Kollam	Chirakara
Kannur	KadannapilliPanapuza	Ernakulam	Edathiruthi	Kottayam	Chirakkadavu
Kannur	Kadannappalli-Panapuzha	Wayanad	Edavaka	Kollam	Chithara
Kottayam	Kadapalmattam	Idukki	Edavetty	Kannur	Chittariparamba
Pathanamthitta	Kadapra	Idukki	Edavetty	Ernakulam	Chittattukara
Thrissur	Kadukutty	Idukki	Edavetty	Malappuram	Chokkad
Ernakulam	Kadungalloor	Pathanamthitta	Ehumattoor	Ernakulam	Chottanikkara
Kottayam	Kaduthuruthi	Kozhikode	Ekarool	Thrissur	Chundal
Thrissur	Kaipamangalam	Kollam	Elamad	Malappuram	Chungathara
Idukki	Kaiparambu	Ernakulam	Elanji	Ernakulam	Cochin
Idukki	Kajikuzhi	Idukki	Elappara	Kasaragod	E Ellery
Thiruvananthapuram	Kanchikkad	Thrissur	Elavally	Thrissur	Eadavilangu
Idukki	Kanchiya	Kottayam	Elikkulam	Kannur	Kakkol
Idukki	Kanchiyar	Kannur	Eramam Kuttoor	Kozhikode	Kakkoor
Kottayam	Kangazha	Idukki	Eratayar	Ernakulam	Kalady
Kannur	Kanichal	Kottayam	Erattupetta	Idukki	Kaliyar
Kannur	Kanichar	Alappuzha	Eravukade	Kasaragod	Kallar

Wayanad	Kanichar	Kannur	Kannoor	Thiruvananthapuram	Kallara
Wayanad	Kaniyambata	Idukki	Kanthalloor	Thiruvananthapuram	Kallikad
Kannur	Kaniyar	Kozhikode	Kappilumpara	Pathanamthitta	Kallooppara
Idukki	Kanjikkuzhi	Kasaragod	Karadka	Ernakulam	Kalloorkkad
Alappuzha	Kanjikkuzhy	Thiruvananthapuram	Karakulam	Kollam	Kalluvathukkal
Thiruvananthapuram	Kanjiramkulam	Palakkad	Karakurussi	Idukki	Kamakshi
Kottayam	Kanjirapilly	Thrissur	Karalam	Idukki	Kamashy
Wayanad	Kanjiyampara	Malappuram	Karali	Kottayam	Kanakary
Idukki	Kanjiyar	Kozhikode	Karassery	Idukki	Karinkunnam
Ernakulam	Kanjoor	Kollam	Karavaloor	Kasaragod	Karinthalam
Kannur	Kankol -Alappadamba	Thiruvananthapuram	Karavaram	Kannur	Karivelloor-Peralam
Kannur	Kannapuram	Thiruvananthapuram	Karimancode	Thiruvananthapuram	Karodu
Wayanad	Kanniyambatta	Idukki	Karimannoor	Kottayam	Karoor
Wayanad	kenichira	Palakkad	Karimpuzha	Alappuzha	Karthikappilly
Palakkad	Keralassery	Kannur	Kolakkad	Kottayam	Karukachal
Kottayam	Kidangoor	Kannur	Kolayad	Ernakulam	Karukutty
Thiruvananthapuram	Kilimannoor	Kollam	Kollam	Malappuram	Karulai
Kasaragod	Kinanoor- Karinthalam	Thiruvananthapuram	Kollayil	Ernakulam	Karumalloor
Ernakulam	Kizhakambalam	Thrissur	Kondazhy	Idukki	Karunapura,
Palakkad	Kizhakkanchery	Palakkad	Kongad	Idukki	Karunapuram
Ernakulam	Kizhumadu	Idukki	Konnathadi	Malappuram	Karuvarakundu
Ernakulam	Kochi	Pathanamthitta	Konny	Alappuzha	Karuvatta
Thrissur	Kodakara	Kannur	Koodali	Idukki	Katapana

Kasaragod	Kodamballoor	Kozhikode	Koodaranchi	Thiruvananthapuram	Kattakada
Alappuzha	Kodamthuruth	Kozhikode	Koodarathy	Idukki	Kattapan
Kozhikode	Kodanchery	Kozhikode	Koodarnhi	Idukki	Kattapana
Kozhikode	Kodaranhi	Kozhikode	Koorachund	Kozhikode	Kattipara
Kozhikode	Kodassery	Kottayam	Koorapada	Ernakulam	Kavalagad
Thrissur	Kodassery	Kozhikode	Koothali	Ernakulam	Kavalangad
Kozhikode	Kodenchery	Kozhikode	Koothaly	Kozhikode	Kavilampara
Idukki	Kodikkulam	Ernakulam	Koothattukulam	Wayanad	Kavumannam
Palakkad	Kodinjampara	Kottayam	Koottickal	Kozhikode	Kayanna
Kozhikode	Kodiyathoor	Malappuram	Koottilangady	Kasaragod	Keenanoor Karinthalam
Kannur	Kodiyoor	Ernakulam	Koovapady	Ernakulam	Keerampara
Pathanamthitta	Koduman	Thrissur	Koratty	Malappuram	Keezhuparambu
Ernakulam	Kodungalloor	Ernakulam	Koratty	Kannur	Kelakam
Thrissur	Kodungaloor	Wayanad	Kotathara	Wayanad	Kelakam
Kozhikode	Kodur	Ernakulam	Kothamangalam	Kottayam	Madappilly
Kozhikode	Koduvally	Pathanamthitta	Kottanadu	Thiruvananthapuram	Madavoor
Idukki	Kokkazhy	Thrissur	Kottanelloor	Kozhikode	Madavoor
Wayanad	Kottathara	Pathanamthitta	Kottangal	Thiruvananthapuram	Madavoor
Kannur	Kottiyoor	Ernakulam	Kottapady	Kasaragod	Madikai
Kozhikode	Kottoor	Ernakulam	Kunnakara	Malappuram	Makkaraparamba
Kannur	Kottoyur	Kozhikode	Kunnamangalam	Thrissur	mala
Ernakulam	Kottuvally	Thiruvananthapuram	Kunnathukal	Ernakulam	Mala
Thrissur	Kozhali	Ernakulam	Kunnathunadu	Palakkad	Malambuzha
Kozhikode	Kozhikode	Kottayam	Kuravilangadu	Malappuram	Malappuram
Kottayam	Kozhuvanal	Kozhikode	Kurrampoondu	Pathanamthitta	Malapuzhassery
Kozhikode	Kudaraji	Kannur	Kurumathoor	Pathanamthitta	Malayalapuzha
Idukki	Kudayathoor	Malappuram	Kuruva	Ernakulam	Malayatoor
Thiruvananthapuram	Kulamannoor	Ernakulam	Kuthattukulam	Thiruvananthapuram	Malayinkeezhu
Kollam	Kulasekarapuram	Alappuzha	Kuthiyathodu	Wayanad	Mallankolly
Thiruvananthapuram	Kulathoor	Ernakulam	Kuttampuza	Pathanamthitta	Mallappally
Idukki	Kumali	Kannur	Kuttiattoor	Kannur	Maloor
Idukki	Kumally	Thiruvananthapuram	Kuttichal	Malappuram	Mambadu
Idukki	kumaramangalam	Kasaragod	Kuttikol	Malappuram	Mampad
Kottayam	Kumaranelloor	Pathanamthitta	Kuttoor	Wayanad	Manadhavady
Kollam	Kumil	Ernakulam	Kuvappady	Idukki	Manadhavady
Idukki	Kumili	Palakkad	Kuzhalmantham	Idukki	Manakade
Ernakulam	Manjalloor	Thrissur	kuzhoor	Thrissur	Manaloor
Ernakulam	Manjapra	Ernakulam	Kuzhupilly	Thiruvananthapuram	Manamboor
Kottayam	Manjoor	Thrissur	Lokhamangaleswaram	Idukki	Manamkandom

Idukki	Mankulam	Thrissur	Madakkathara	Wayanad	Mananthavadi
Kozhikode	Mankuthokara	Kottayam	Marangattupally	Kottayam	Manarkadu
Alappuzha	Mannanchery	Alappuzha	Mararikulam	Wayanad	Manathavadi
Alappuzha	Mannar	Idukki	Marayoor	Ernakulam	Maneed
Alappuzha	Mannassery	Idukki	Mariyapuram	Kannur	Mangattydam
Kottayam	Mannimala	Kozhikode	Marunthokara	Kottayam	Mangoor
Ernakulam	Maradi	Kozhikode	Maruthongara	Thiruvananthapuram	Manikkal
Thiruvananthapuram	Maranalloor	Thrissur	Mathilakam	Kottayam	Manimala
Kottayam	Meenachil	Palakkad	Mathoor	Wayanad	mootil
Kottayam	Meenadam	Kannur	Mattannoor	Kannur	Moozhakunnu
Wayanad	Meenangaadi	Thrissur	Mattathoor	Wayanad	Mottil
Kottayam	Melakave	Ernakulam	Mattathoor	Ernakulam	Mudackuzha
Thrissur	Meloor	Alappuzha	Mavelikkara Muncipality	Alappuzha	Muhamma

Kottayam	Melukave	Kollam	Mayyanad	Kozhikode	Mukkam
Kozhikode	Mepayoor	Ernakulam	Mazhavannoor	Kottayam	Mulakkulam
Wayanad	Meppadi	Ernakulam	Mazhuvannoor	Alappuzha	Mulakkuzha
Thrissur	Methala	Wayanad	Muttil	Kottayam	Mulakulam
Pathanamthitta	Mezhuveli	Wayanad	Muttil South	Thrissur	Mulakunnathukav
Kozhikode	Mokkam	Kannur	Muzhakkunu	Wayanad	Mulamkolly
Ernakulam	Moodakuzha	Ernakulam	Muzhavannoor	Ernakulam	Mulanthuruthy
Ernakulam	Mookanjoor	Pathanamthitta	Mylapra	Wayanad	Mullamkolly
Ernakulam	Mookannor	Thrissur	Nadathara	Kannur	Mullankolly
Ernakulam	Mookkannoor	Wayanad	Nadavayal	Thrissur	Mullassery
Kottayam	Moonilav	Kozhikode	Naduvannoor	Thrissur	Mundathikkodu
Malappuram	Moorkkanad	Kannur	Naduvil	Palakkad	Mundoor
Malappuram	Moothedam	Kannur	Naduvul	Wayanad	Mupainad
Wayanad	Nenmani	Thiruvananthapuram	Nagaroor	Wayanad	Mupanad
Kannur	New Naduvil	Kozhikode	Nallalam	Thrissur	Muriyad
Thiruvananthapuram	Neyyattinkara	Palakkad	Nalleppilly	Palakkad	Muthalamada
Malappuram	Nilamboor	Kozhikode	Nanmanda	Malappuram	Muthedam
Kollam	Nilamel	Thiruvananthapuram	Nanniyode	Kottayam	Mutholy
Malappuram	Nillamboor	Pathanamthitta	Naranganam	Wayanad	Mutil
Kottayam	Njizhoor	Kozhikode	Narikuni	Idukki	Muttam
Kottayam	Njizhoor	Kozhikode	Narikuzhy	Palakkad	Palakkad
Kozhikode	Nochad	Kozhikode	Narippara	Ernakulam	Palakkuzha
Kozhikode	Nochat	Wayanad	Nariyode	Alappuzha	Palamel
Wayanad	Noolpuzha	Thrissur	Nattika	Ernakulam	Pallarimangalam
Kottayam	Nyeezhoor	Thiruvananthapuram	Navaikulam	Palakkad	Pallassena
Ernakulam	Okkal	Idukki	Nedukandam	Thiruvananthapuram	Pallichal
Pathanamthitta	Omalloor	Kottayam	Nedukunnam	Pathanamthitta	Pallikkal
Kozhikode	Omasserry	Thiruvananthapuram	Nedumangad	Ernakulam	Pallikkara
Palakkad	Ongalloor	Ernakulam	Nedumbasery	Kottayam	Pallikkathodu
Malappuram	Oorgantiri	Pathanamthitta	Nedumbram	Kottayam	Pallikkathodu
Palakkad	Ottapalam	Idukki	Nedumgandum	Kannur	Pallikkunnu
Thiruvananthapuram	Ottasekharamangalam	Kollam	Nedumpana	Idukki	Pallivasal
Kannur	Paayam	Ernakulam	Neeleeswaram	Idukki	pambadumpara
Idukki	Pabadumpara	Kottayam	Neendoor	Kottayam	Pambady
Wayanad	Padijarathara	Malappuram	Nellakota	Ernakulam	Pambakkuda
Thrissur	Padiyoor	Thiruvananthapuram	Nellanade	Idukki	Pambattumpara
Kannur	Padiyoor	Ernakulam	Nellikuzhi	Ernakulam	Pampakuda
Ernakulam	Paigottoor	Kannur	Payam	Thrissur	Panachery
Idukki	Paingottur	Kannur	payavoor	Alappuzha	Panachery
Ernakulam	Paipara	Ernakulam	Payipra	Kottayam	Panachikkadu
Kannur	Paisakari	Kannur	Payyam	Kozhikode	Panagadu
Kasaragod	Paivalike	Kannur	Payyavoor	Wayanad	Panamaram
Kottayam	pala	Thiruvananthapuram	Pazhayakunnummel	Idukki	Panamaram
Kottayam	Pala Muncipalitty	Thrissur	Pazhayannur	Idukki	Panamaram
Thrissur	Porathysery	Kasaragod	Peelikode	Wayanad	Panamaram
Thrissur	Porkulam	Ernakulam	Peendimana	Thrissur	Pananchery

Kollam	Poruvazhy	Thiruvananthapuram	Penkal	Kozhikode	Pananghadu
Malappuram	Pothakallu	Kannur	Peralussery	Kasaragod	panathady
Ernakulam	Pothanikade	Kozhikode	Perambra	Alappuzha	Panavally
Ernakulam	Pothanikkade	Kannur	Peravoor	Thiruvananthapuram	Panavoor
Malappuram	Pothukall	Thiruvananthapuram	Peringamala	Kollam	Panayam
Malappuram	Pothukallu	Pathanamthitta	Peringara	Kozhikode	Panghadu
Thrissur	Poyya	Kannur	Peringom	Thiruvananthapuram	Pangode
Wayanad	Pozhuthana	Kannur	Peringomvayakkara	Thrissur	Panjal
Pathanamthitta	Pramadom	Thrissur	Perinjanam	Kollam	Panmana
Ernakulam	Prayipra	Malappuram	Perinthalmanna	Pathanamthitta	Panthalam

Kozhikode	Puduppadi	Alappuzha	Perumbalam	Pathanamthitta	Panthalamthekkekara
Wayanad	Pulapally	Ernakulam	Perumbavoor	Ernakulam	Parakkadavu
Thiruvananthapuram	Pulimath	Thiruvananthapuram	Perumpazhuthoor	Thiruvananthapuram	Parassala
Thiruvananthapuram	Pullampara	Thiruvananthapuram	Perunkadavila	Kottayam	Parathode
Kasaragod	Pullur Periya	Malappuram	Peruvalloor	Kottayam	Parathodu
Wayanad	Pulppally	Kozhikode	Peruvayal	Thrissur	Pariyaram
Kottayam	Punjar	Ernakulam	Pindimana	Kannur	Pariyaram
Kottayam	Punjar Thekkekkara	Ernakulam	piravam	Ernakulam	Pariyaram
Wayanad	Punnady	Ernakulam	Piravom	Palakkad	Pattambi
Alappuzha	Punnapra	Malappuram	Ponmala	Alappuzha	Pattanakkad
Alappuzha	Punnaprasouth	Thrissur	Poomangalam	Thrissur	Pavaratty
Thrissur	Punnur	Kottayam	Poonjarthekkekkara	Wayanad	Sreekandapuram
Idukki	Purapuzha	Thrissur	Poonjoor	Palakkad	Sreekrishnapuram
Wayanad	puthady	Wayanad	Poothady	Ernakulam	Sreemoolanagaram
Thrissur	Puthenchira	Kannur	Poothady	Thrissur	Sreenarayanapuram
Ernakulam	Puthenvelikkara	Wayanad	Poothady	Kannur	Srikandapuram
Palakkad	Puthoor	Kollam	Poothakulam	Wayanad	Sulthanbathery
Palakkad	Puthukkodu	Ernakulam	Poothrikka	Kottayam	Teekoy
Kozhikode	Puthuppady	Ernakulam	poothrikka	Palakkad	Thachambara
Kottayam	Puthuppally	Thiruvananthapuram	Poovachal	Alappuzha	Thaikkattussery
Thrissur	Puthur	Thiruvananthapuram	Pooval	Alappuzha	Thakazhy
Wayanad	puuthady	Kollam	Pooyappally	Kannur	Thalakode
Malappuram	Puzhakkattiri	Wayanad	Pooyhady	Kottayam	Thalanadu
Ernakulam	Pyngotoor	Alappuzha	Thekkekara	Kottayam	Thalapulam
Idukki	Rajakattu	Thrissur	Thekkumkara	Palakkad	Thaleppilly
Idukki	Rajakkad	Palakkad	Thenkurussy	Kannur	Thalipparambu
Idukki	Rajakkade	Kollam	Thevalakkara	Alappuzha	Thamarakulam
Ernakulam	Rajakumari	Kottayam	Thidanadu	Kozhikode	Thamarasserry
Idukki	Rajakumary	Kottayam	Thikkoy	Malappuram	Thanaloor
Ernakulam	Ramamanghalam	Kannur	Thillenkeri	Alappuzha	Thannirmukkam
Kozhikode	Ramanattukara	Wayanad	Thinanelli	Pathanamthitta	Thannithode
Kottayam	Ramapuram	Ernakulam	Thirumarady	Wayanad	Thariode
Ernakulam	Rayamangalam	Wayanad	Thirunelly	Wayanad	Thariyodu
Wayanad	S.Bathery	Thiruvananthapuram	Thirupuram	Wayanad	Thavijal
Idukki	Santhanpara	Malappuram	Thiruvali	Wayanad	Thavinchal
Idukki	Senapathy	Pathanamthitta	Thiruvalla	Idukki	Thavinhal
Palakkad	Sholayoor	Ernakulam	Thiruvambady	Wayanad	Thavinhal
Kollam	Sooranad	Kozhikode	Thiruvampady	Kannur	Thavinjal
Kollam	Sooranad North	Thiruvananthapuram	Thiruvananthapuram	Wayanad	Thavinjal
Kollam	Sooranad South	Kozhikode	Thiruvani	Malappuram	Thazhekode
Idukki	Udumbanoor	Thrissur	Thiruvilwamala	Kottayam	Theekoy
Kozhikode	Ulliery	Idukki	Thodupuzha	Kozhikode	Vatakara
Kannur	Ullikal	Thiruvananthapuram	Tholikode	Idukki	Vathikudy
Kozhikode	Unnikulam	Thrissur	Tholoor	Alappuzha	Vayalar
Idukki	Upputhura	Kasaragod	Thondarnadu	Idukki	Vazathop
Malappuram	Urangatory	Wayanad	Thondarnadu	Ernakulam	Vazhakulam
Kozhikode	Urangatory	Wayanad	Thondernad	Idukki	Vazhathopp
Kozhikode	Urangattiri	Wayanad	Thonduoornadu	Idukki	Vazhathoppe
Malappuram	Urnghattiri	Wayanad	Thottappara	Idukki	Vazhathoppu
Thiruvananthapuram	Uzhamalackal	Pathanamthitta	Thottapuzhasserry	Malappuram	Vazhikkadvi
Kottayam	Uzhavoor	Kollam	Thrikadavoor	Pathanamthitta	Vechoochira
Kozhikode	Vadakara	Malappuram	Thrikalanghadu	Ernakulam	Vegoor
Ernakulam	vadakkekara	Kasaragod	Thrikarippur	Malappuram	Veliancode
Palakkad	Vadakkumchery	Palakkad	Thrikkadeeri	Kollam	Velinelloor
Pathanamthitta	Vadasserikara	Kollam	Thrikkaruva	Idukki	Veliyamattom
Ernakulam	Vaingottor	Kottayam	Thrikkodithanam	Kottayam	Veliyannoor
Ernakulam	VALAKAM	Ernakulam	Thripunithara	Wayanad	Vellamunda
Wayanad	Vallamunda	Thrissur	Thrissur	Thiruvananthapuram	Vellanad

Palakkad	Vallapuzha	Alappuzha	Thuravoor	Thiruvananthapuram	Vellanatt
Alappuzha	Vallikunnam	Wayanad	Tirunelli	Thiruvananthapuram	Velland
Thiruvananthapuram	Vamanapuram	Palakkad	Trithala	Thrissur	Vellangallur
Idukki	Vandanmedu	Kannur	Udayagiri	Thiruvananthapuram	Vellarada
Palakkad	Vandazhy	Wayanad	Udayagiri	Idukki	Vellathooval
Idukki	Vandiperiyar	Kottayam	Udayanapuram	Idukki	Vellathuval
Malappuram	Vandoor	Ernakulam	Udhayamperoor	Kottayam	Vellavoor
Kozhikode	Vanimel	Idukki	Udumbancholla	Idukki	Velliamattom
Palakkad	Vaniyamkulam	Thiruvananthapuram	Vembayam	Palakkad	Vellinezhi
Idukki	Vannapuram	Kannur	Vengad	Idukki	Velliyamattom
Thrissur	Varandrapilly	Kannur	Vengadu	Thrissur	Velloor
Ernakulam	Varappetty	Wayanad	Vengapilly	Thrissur	Velookara
Malappuram	Vettathoor	Ernakulam	Vengola	Thiruvananthapuram	Vithura
Kottayam	Vijayapuram	Ernakulam	Vengoor	Wayanad	Wayandu
Thiruvananthapuram	Vilavoorkal	Wayanad	Venjapilli	Kasaragod	West Elery

The project activity qualifies under "*activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential applications (e.g. for supply to households).*" According to the approved carbon offset methodology, "*examples of these technologies that displace or avoid fossil fuel use include, but are not limited, to biogas cook stoves"* (project activity). The baseline is the fuel consumption of the thermal application that would have been used in the absence of the project activity.

The project activity results in reductions of CO_2 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 environmentally additional and also meet the "*Do No Net Harm to Society and Environment*" criteria under the ***UCR CoU Standard***. The project activity also contributes to 7 (seven) major UN sustainable development goals (SDGs).

The details of the registered project are as follows:

Purpose of the project activity:
The **Andhyodaya Bundled Small Scale Rural Biogas Projects (Phase 2), Kerala** is located across many villages in the Districts: Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur and Wayanad, State: Kerala, Country: India and setup by the Non-Governmental Organisation (NGO) – The Andhyodaya (Project Proponent-PP). Unlike other NGO's, the PP concentrates in four areas of development activities namely the non-conventional energy promotion, environment sanitation with emphasis on water management, farmers self help groups and low cost building technology. The PP has undertaken projects and programmes related to the UN SDGs with a focus on rural community development.

Prior biogas programs (similar but unrelated to this particular UCR project activity) by the PP have generated carbon offsets and bought by leading global financial institutions such as the IFC- World Bank Group (source: IFC Annual Report 2008) to offset the carbon footprint of the IFC global business operations. IFC considers such projects (which generates no smoke or soot), to have strong community benefits, with a delivery model that enhances the health, safety, and economic well-being of the communities in which such projects operates.

The technology used in this project activity is the household level biogas plants and the owner of

the technology is the particular household using biogas plants and the PP who maintains the biogas systems for the liftime of the activity. The project activity aims at avoidance of fuel wood (firewood) consumption by traditional stove users by switching to bio-digester (biogas) technology using cow dung as a renewable energy fuel. The implemented biogas units for cooking needs helps reduce the amount of fuel wood used for cooking and water heating and replaces inefficient traditional cooking stoves with cleaner biogas stoves. ***Hence, the project activity reduces CO_2 emissions by 45978 tonnes/year by avoiding the burning of non-renewable biomass for cooking and water heating purposes.*** This technology also reduces methane (CH_4) emissions from cattle manure and contributes strongly to the sustainable development of the rural households involved in the project activity. The overall objectives of the project activity are reduction of greenhouse gases, conservation of forests and woodlands as well as improved health conditions of end users due to improved indoor air quality.

The purpose of the project activity is the set up of **13828** independent biogas plants (digesters) of capacities **2m^3**, each serving individual households comprising of an average of 4-7 members, using cattle dung (renewable energy fuel) collected from buffaloes, cows and calves currently being housed at such rural households in the villages located across the districts of Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur and Wayanad, in the state of Kerala. 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.**

At the time of the commissioning of the project activity, the use of biogas as a viable cooking option was minimal in the state of Kerala (as per the data table below).

COOKING FUEL USE PATTERN IN KERALA

The fuel use pattern for cooking in Kerala is given in table 2. Majority of the households depends on firewood and other biomass like crop residue , cow dung cake etc, for cooking. Total use of biomass as fuel in Kerala is about 79.3 %. Only 17.7 % of the household has access to LPG. 0.8 % of the households uses biogas for cooking, as per the 2001 census data.

Table -2 Cooking Fuel usage pattern in Kerala
(Source: Census of India 2001)

Types of fuel used for cooking	No of Households	percentage
Fire wood	5107552	77.4
Crop residue	116947	1.8
Cow dung cake	3814	0.1
Coal, lignite, charcoal	3204	0.0
Kerosene	113890	1.7
LPG	1168536	17.7
Electricity	6285	0.1
Biogas	50078	0.8
Any other	5926	0.1
No Cooking	18974	0.3
Total	6595206	100.00

In fact a recent survey done (*survey source : Nielsen India Pvt. Ltd., March 2016*), it was shown that more than two thirds of all households in Kerala still reported using traditional mud cookstove (fixed model). Four out of every five rural and one out of every five urban households in India primarily

depend on direct burning of solid biomass fuel like fire wood, crop residue and cattle dung in traditional mud stove/ three stone fire for cooking. Easily available in the premises / neighbourhood and traditional practices being used for long time are the two key reasons for continue using firewood in Kerala.

FIREWOOD PURCHASE PRACTICES

No. of times purchased 8-10 times in an year	Average amount of wood purchased around 400 Kg / last purchase	Rs.1700 paid last time for firewood i.e. about Rs.4-5 / Kg
Kannur districts reported high cost of wood Varies in the range of Rs.5 – 10 / Kg	67% of the households (those who are purchasing firewood) purchasing from the same neighbourhood	70% of the households (those who are purchasing firewood) paying transportation charges – average charges – Rs.250/
Less than 5% households reported purchasing coconuts husks and coconut leaves		Households reported purchasing firewood spend about Rs.750/ month for firewood purchase only

(source: KERALA CONSUMER SEGMENTATION STUDY FINAL REPORT
Prepared by Nielsen India Pvt. Ltd., March 2016)

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 ºC, 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. 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.

This project activity contributes strongly to sustainable development of the rural households involved in the project. A biogas plant of even 2 m3 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 (IFSR)

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

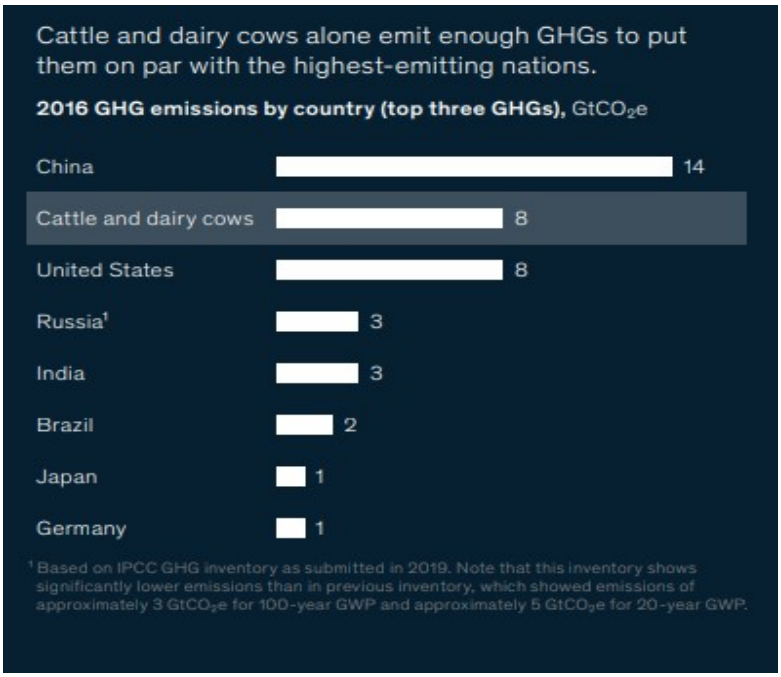
https://www.un.org/esa/forests/wp-content/uploads/2018/03/UNFF13_Background_Note_Wood_Energy_in_India-TERI.pdf

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) across India. 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 untrreated in most villages.

Livestock production can result in methane (CH_4) emissions from enteric fermentation and both CH_4 and nitrous oxide (N_2O) emissions from livestock manure management systems. Cattle are an important source of CH_4 in many countries because of their large population and high CH_4 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. Biogas has a significant impact on rural women's lives. 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.

- 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 households in the project activity 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.

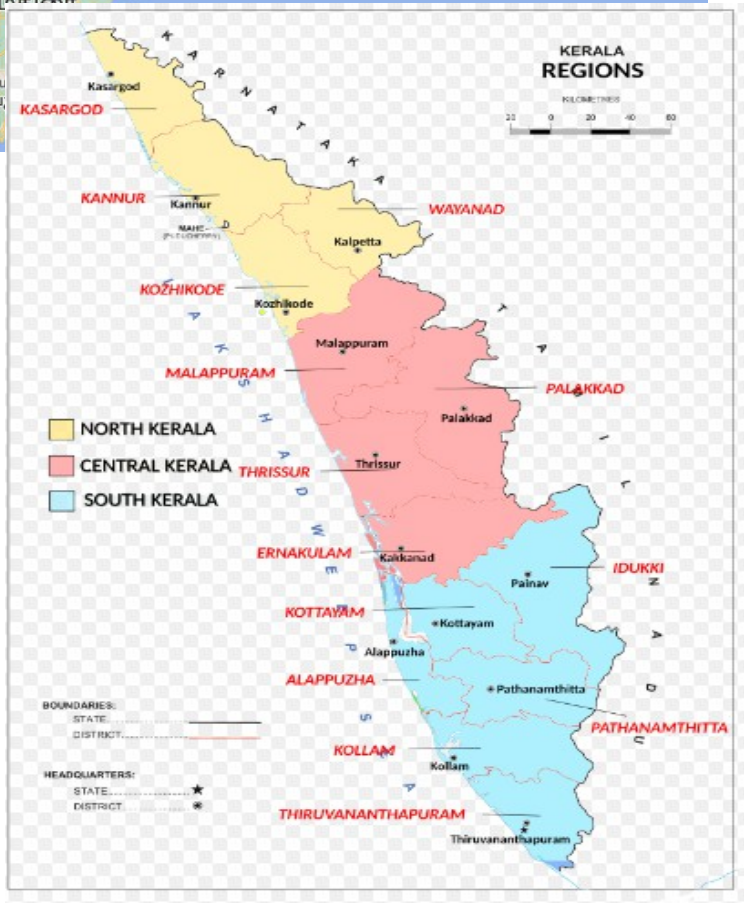
The project activity also contributes to the following UN sustainable development goals (SDGs):

1. SDG 1: No Poverty
2. SDG 3: Good health and well being
3. SDG 7: Affordable and Clean energy
4. SDG 8: Decent work and economic growth
5. SDG 13: Climate Action
6. SDG 15: Life on Land
7. SDG 17: Partnerships for the goals

Sustainable Development Goals Targeted	Most relevant SDG Target SDG Impact	Indicator (SDG Indicator)
13 Climate Action (mandatory)	13.2: Integrate climate change measures into national policies, strategies and planning	Amount of GHG Emission reduction
1 - End poverty in all its forms everywhere	1.4: By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	Number of household the bio digesters are installed & operating
3 – Ensure healthy lives and promote well-being for all at all ages	3.9: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Number of households having reduced indoor pollution
7 – Ensure access to affordable, reliable, sustainable and modern energy for all	7.1: By 2030, ensure universal access to affordable, reliable and modern energy services	Number of household the bio digesters are installed & operating
8 – Promote inclusive and sustainable economic growth, employment and decent work for all	8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value 8.6 By 2020, substantially reduce the proportion of youth not in employment, education or training	Number of jobs created Number of people trained
15 – Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss	15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally	Amount of fuel wood saved by the project
17 – Strengthen the means of implementation and revitalize the global partnership for sustainable development	17.7: Promote the development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms including on concessional and preferential terms, as mutually agreed	Number of new technology digesters installed that are produced in India. IFC-World Bank Group had purchased carbon credits in support of the earlier biogas project from the same PP.

A.3. Location of project activity >>

Country: India
District: Alappuzha, Ernakulam, Idukki, Kannur, Kasaragod, Kollam, Kottayam, Kozhikode, Malappuram, Palakkad, Pathanamthitta, Thiruvananthapuram, Thrissur and Wayanad
State: Kerala
Latitude: 11° 15' 30.1788" N
Longitude: 75° 54' 36.1224" E



A.4. Technologies/measures >>

A total of **13828** independent biogas plants (digesters) of capacities **2m^3** each, have been installed since 01/01/2002. 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 gobar 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.

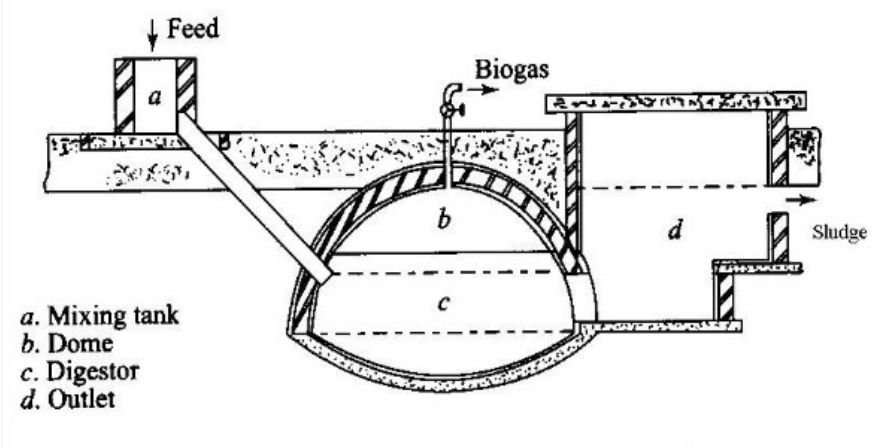
Capacity/Year	2002	2003	2004	2005	2006	2007	Total
2m3	2550	2839	2639	2386	1915	1499	13828
						Total	13828

Installations in the project activity

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 manjority of the digesters are of the fixed dome Deenabandhu model, however, a few are of the floating drum model. The 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 drum model.

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

Mixing Tank

Biogas Stove

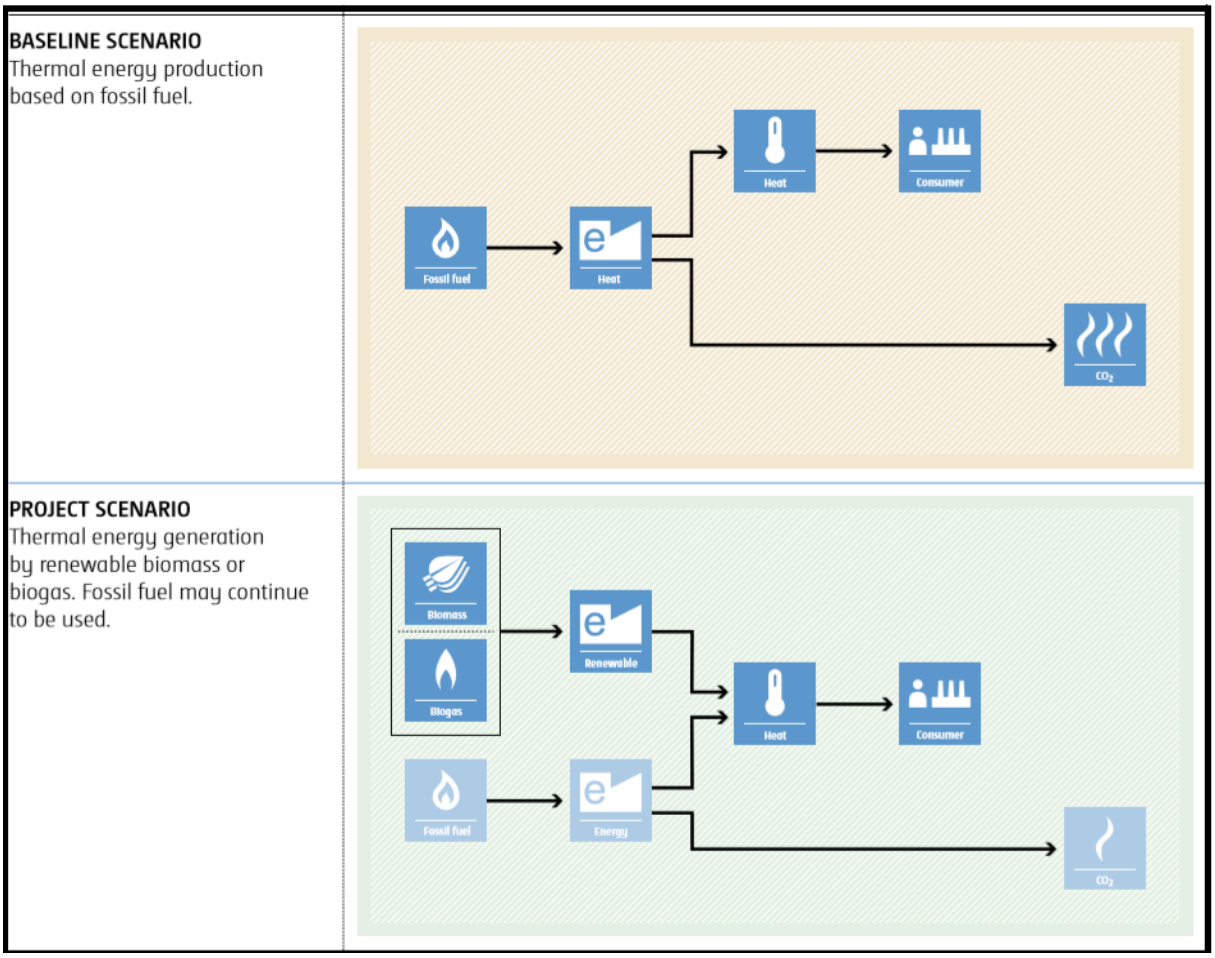
The technical specifications of the Deenbandhu model bio-digesters installed are as follows:

Specification	Value
Total installed capacity	27656 m^3
Mixing Proportion	(Water: Dung) 1:1
Number of units (digesters)	13828
Feed Material	Cattle Dung
Biogas Flow rate	0.47 m^3/hr (4.2 hrs/day Nijajuna, B. T. (2002) pg.157)
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^3 Source: Nijajuna, B. T. (2002): Biogas Technology. New Age International Publishers. New Delhi.
Rated Capacity (thermal) $MW_{thermal}$	17.96 MW_{th}

A.5. Parties and project participants >>

Party (Host)	Participants
India	Project Proponent: The Andhyodaya, Ernakulam, Kerala, India.

A.6. Baseline Emissions>>



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.

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 2013-2022 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

SCALE- Small-scale Methodology

CATEGORY- ***AMS-I.I. Biogas/biomass thermal applications for households/small users (Ver 06)***
This category comprises activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional applications (e.g. for supply to households, small farms or for use in built environment of institutions such as schools). Examples of these technologies that displace or avoid fossil fuel use include but are not limited to biogas cook stoves, biomass briquette cook stoves, small scale baking and drying systems, water heating, or space heating systems.

B.2. Applicability of methodologies and UCR 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 $2m^3$ 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 17.96 Mw_{th} which is not greater than the small scale thresholds defined by the applied methodology I.E. the limit of 45 MW_{th} is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves)". Each unit has a rated capacity of 1.29 Kwh which is less than 150 kW thermal as required under the methodology.

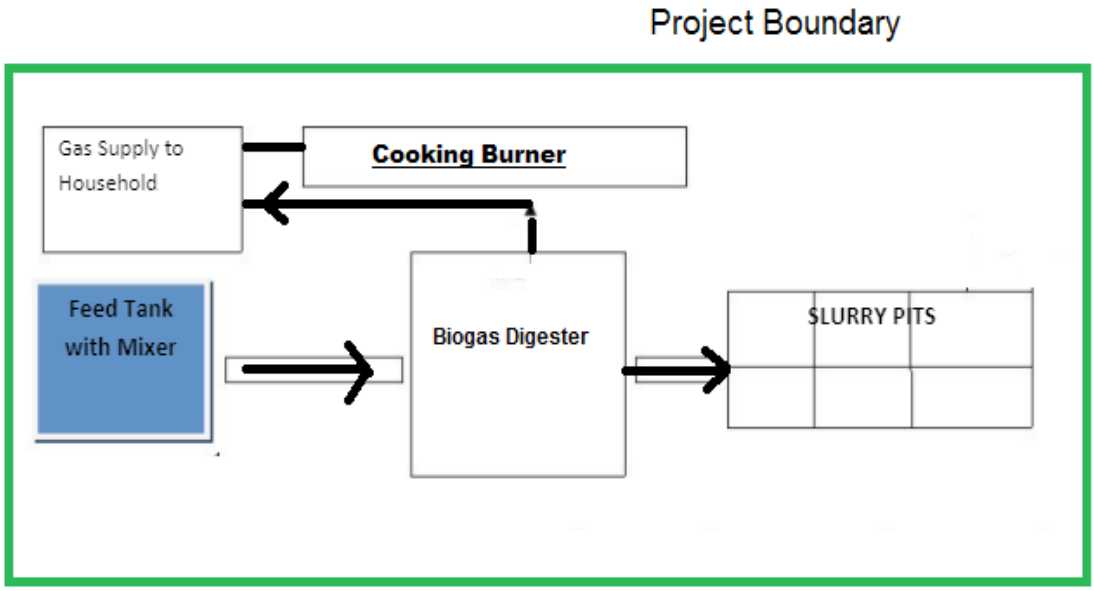
B.3. Applicability of double counting emission reductions >>

Each of the biogas unit is constructed by the PP close to the households. 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 is the physical, geographical site of the use of biomass or the renewable energy, hence the project boundary includes the physical, geographical site(s) of:

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



	Source	GHG	Included?	Justification/Explanation
Baseline	Emissions from burning non-renewable wood	CO_2	**Included**	Major source of emission
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Activity	Combustion of renewable biogas for cooking Emissions from residue from anaerobic digester	CO_2	Excluded	Heat is generated from collected biogas, hence these emissions are not accounted for. CO2 emissions from the decomposition of organic waste are not accounted
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative

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

Leakage related to the non-renewable woody biomass saved by the project activity: The following potential source of leakage shall be considered:

- (a) The use/diversion of non-renewable woody biomass saved under the project activity by nonproject households/users that previously used renewable energy sources. If this leakage

assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users, that is attributable to the project activity, then BEy is adjusted to account for the quantified leakage.

- (b) Alternatively, BEy is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

There is no transfer of equipment, being currently utilized transferred, from outside the project boundary to the project boundary. All the biogas units are constructed at the site. Thus leakage from equipment transfer need not be monitored.

Option (b) is selected wherein, *"BEy is multiplied by a net to gross adjustment factor of 0.95 to account for leakages",* and hence in this case, surveys of non-renewable woody biomass used by the non-project households/users will not be required.

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

Emission reductions are only be applied to systems that are demonstrated to be operational during the monitoring period.

Estimated Annual Baseline Emission Reductions: $BE_y = HG_{ythermal} \times EF_{FF, CO2}$

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

$EF_{FF, CO2}$ = CO_2 emission factor of the fossil fuel displaced in the baseline as determined by the UCR Standard.

GWP_{CH4} = 21 is the default IPCC value of CH_4 applicable to the crediting period (tCO_{2e}/t CH_4)

NCV_{CH4}= NCV of methane (MJ/Nm^3) (default value: 35.9 MJ/Nm^3)
$NCV_{biomass}$ = 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) = 48398 tCO2eq/yr

Project Emissions due to leakage (L) = 2419 tCO2eq/yr

Estimated total Emission Reductions per year (ER_y) = 45978 tCO2eq/yr (45978 CoUs/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>>
Monitoring Period: 01
1st Monitoring Duration: 10 years, 0 months – 01/01/2013 to 31/12/2022
1st Issuance Period: 10 years, 0 months – 01/01/2013 to 31/12/2022

B.8. Monitoring plan>>
The PP has a large team engaged in the project activity consisting of nearly 150 master masons, 20 district/ taluk level coordinators and 5 Engineers. A record keeping system is operated and maintained for each biogas digester by the PP, which contains at least the following information

- Name and ID of the system
- Date of construction
- Location
- Repair History

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.

THE ANDHYODAYA BIOGAS PROGRAMME

Annual Monitoring Report by Field staff

Year: **Date of Visit :**

1	Biogas Plant UID No.	:	
2	Address of Biogas Plant	:	
3	Name of District ; Gramapanchyath/Municipality	:	
4	Number of family members	:	4 /5 /6 /7 /8 /9
5	Capacity & Type of Biogas plant	:	1m3 /2m3 /3m3 /4m3 /6m3
		:	Fixed /Dome /Floating Drum
6	Year of installation of Biogas plant	:	
7	Number of cattle	:	2 /3 /4 /5 /6
8	Approximate quantity of cow dung & organic waste available per day in **KG**	:	25 /50 /75 /100 /125
9	Is the family feeding biogas plant everyday		Yes / No
10	Do they feed any Non-organic matter into the biogas plant	:	Yes / No
11	Is there slurry discharge everyday	:	Yes / No
12	Has family done periodical refilling of biogas plant	:	Yes / No
13	Does get into the biogas plant from outside	:	Yes / No
14	Is the biogas pipeline proper	:	Yes / No
15	Is the biogas stove functional	:	Yes / No
16	Has the family done any alteration to biogas stove	:	**Yes** / **No**
17	Is the family cleaning the stove every quarter	:	Yes / No
18	Is the family able to save time for cooking in comparison with use of fire wood	:	Yes / No
19	Do they get the required quantity of gas everyday	:	Yes / No
20	Is the family happy about the biogas plant	:	Yes / No

Name & signature of field staff :

Sample Annual Monitoring Report on File

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 maintenence 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. If the sample size calculation returns a value of less than 30 samples, a minimum sample size of 30 will be chosen.