



DISTRIBUTION OF IMPROVED COOK STOVE - PHASE 18



Document Prepared by EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The project activity (usage of improved cook stoves) has been deployed to facilitate clean cooking practice and reduce health risk due to indoor air pollution¹ along with reduction of drudgery amongst the tribal households (Schedule Tribe) and families living below the poverty level (BPL category²) across Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts which lies in Aurangabad, Amravati and Nagpur Divisions of Maharashtra. . The usage of improved cook stoves through replacement of inefficient traditional cook stove contributes towards reduction of greenhouse gas emission, reduction of by-products of incomplete combustion like black carbon and conservation of fuel wood resulting in prevention of forest degradation. The higher efficient portable, single pot improved cook stoves distributed under the project activity has changed the prevailing practice of usage of traditional cook stoves across selected households in rural areas Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts of Maharashtra who are provisioned with improved cookstoves under the project activity.

It is worthwhile to note that firewood and wood chips contributes as major cooking fuel amongst rural households in India. According to the NSSO³ 61st round survey, a considerable percentage of rural population of Maharashtra relies upon fire wood for cooking and the percentage is substantially much higher amongst the lower MPCE (Monthly Per Capita Expenditure) group. Since, the beneficiary selected under the project belongs to BPL and ST category of population in terms of capacity of expenditure therefore; improved cook stove use results in substantial fuel wood saving as this section is the major consumer of fuel wood.

The improved cook stoves distributed under the project activity are more efficient with thermal efficiency of 29.88%⁴ as compared to traditional stoves with thermal efficiency of around 10%⁵. Owing to higher efficiency, use of efficient improved cook stove results in reduced consumption of non-renewable biomass in compared to baseline by minimizing thermal energy losses and facilitating complete combustion. Reduced consumption/ combustion of non-renewable biomass results in reduction of GHG emission.

Technology Employed

¹ Household Cook stoves, Environment, Health and Climate Change – World Bank (Executive summary, page 9-11)

² As per the article in The Hindu (<http://www.thehindu.com/news/national/article3013870.ece>) dated March 20, 2012 anyone with daily consumption expenditure below Rs. 22.42 is categorised under BPL. The article depicts of 24.5% of the total population in Maharashtra under BPL in 2009-10.

³National Sample Survey Office

⁴ Thermal Efficiency Test Report of Improved Cook stove tested at Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur

⁵ Paragraph 6 (Option 2) of approved applicable methodology AMS –II.G., Version 04

The cook stove deployed under the project activity⁶ is single pot, portable, metallic, improved biomass cook stoves⁷ made of cast iron for combustion of solid biomass. The improved cook stoves are manufactured in accordance to IS 13152, Part-1: 1991, CPRI Design Type I⁸ standard. The design ensures complete combustion of biomass. The cook stove is tested for thermal efficiency (29.88%) as per water boiling test protocol specified in IS 13152, Part 1: 1991.

Measures undertaken

The Rural Development and Water Conservation (RDWC) Department, Government of Maharashtra is involved in promoting betterment of living standard for the tribal household (ST) and families living Below Poverty Line (BPL) in villages of Maharashtra. The department as a part of its aforesaid programme selects households from amongst the ST and BPL category depending upon level of vulnerability (assessed on basis of 13 parameters: Category and size of usable land, Type of house, Availability of regular usable clothes, Protection of food or food security, Cleanliness, Ownership of required goods, Heights /Level of literacy, Family working capacity, Source of livelihood goods, Number of children in age group (5 to 14), Type of bankruptcy, reason for staying away from family of Earning member, Choice of help /Yojana)⁹ and provide financial assistance to facilitate better and hygienic living standard. The household selected for financial assistance under the programme is provided with an improved cook stove system. The household considered as end users of cook stoves under the project activity are poor enough to afford for procurement of improved cook stoves and are also least interested towards similar investment as wood is available for free. So, in absence of the improved cook stove disseminated under the project activity the household would have continued with use of traditional cook stoves. Since, the project activity is conceived under the program of Govt. of Maharashtra which provides cook stove only to BPL and ST category household so; there is no chance of cook stove to be distributed to non-baseline household. The identification of beneficiaries and distribution of cook stoves comes under the preview of the Rural Development and Water Conservation Department. The project activity includes dissemination of 14,400 Nos. improved cook stoves¹⁰ amongst Below Poverty Line (BPL) and Scheduled Tribes (ST) households in rural areas of Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts which lies in Aurangabad, Amravati and Nagpur Divisions of Maharashtra upon signing of the end user Tripartite Agreement¹¹.

The project through conservation of non-renewable biomass was estimated to result in an greenhouse gas emission reduction of 12,945 tCO_{2e} annually (ex-ante). The revenue from carbon financing was conceived in deciding upon the capital cost as well as to meet up the cost towards imparting awareness and training, periodic maintenance¹² and post lifetime replacement within the crediting period.

6 Manufactured by Vikram Stoves and Fabricators (Ministry of New and Renewable Energy) approved manufacturer and distributor of improved cook stoves) selected by RDWC Department, Government of Maharashtra for distribution of improved cook stoves amongst identified beneficiaries.

7 MNRE accredited system -<http://mnre.gov.in/schemes/decentralized-systems/national-biomass-cookstoves-initiative/>

8 The design of the cook stove is certified by Bureau of Indian Standards relating to its appropriateness to, IS 13152 (Part1).

9 Criteria issued by Department of rural Development, Government of Maharashtra

10 Each of the cook stoves is included for the purpose of emission reduction calculation from the day on which it is distributed to the beneficiary and the end user agreement is signed.

11 Tripartite Agreement is for transfer the emission reduction right to the Project Participant by each beneficiaries/end users and is signed amongst end user, GKEMPL and Vikram Stoves. The tripartite agreement authorizes M/s G K Energy Marketers Pvt. Ltd (hereafter referred to as GKEMPL) by Vikram Stoves (manufacturer of improved cook stoves) and the end users for securing of carbon finance

¹² "The Indian stove programme: an insider's view – the role of society, politics, economics and education" by Bhaskar Sinha, National Institute of Science, Technology & Development Studies (NISTADS), CSIR, New Delhi outlines that the woman are

The amount of emission reductions achieved for the current monitoring period is 61,178 tCO₂e.

The start date of the project activity is 06-October-2012.

Since the project activity of improved cook stove usage by the end user does not require any construction or significant pre-project implementation, nor financial commitment on the part of end user therefore the real action pertaining to the earliest date of distribution of improved cook stoves under the project activity is considered as the start date as per project start date definition of section 3.7 of the VCS Standard V.4.2.

1.2 Sectoral Scope and Project Type

- Sectoral Scope: 3- Energy demand
- Project Type: Type II.G.

The project activity fulfills the applicability criteria of small- scale project activity, Type II – Energy Efficiency Improvement Projects, Category G –‘Energy efficiency measures in thermal applications of non-renewable biomass’ of the ‘Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-scale Project Activity Categories’.

This is non-AFLOU type of project

1.3 Project Proponent

Organization name	M/s G K Energy Marketers Pvt. Ltd
Contact person	Mr. Gopal Kabra
Title	Authorized Signatory
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Email	gopal@energymarketers.in

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Pankaj Rajpoot
Title	Assistant Manager- Operations
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91- 7828347589
Email	registry@enkingint.org

least interested for maintenance as they do not perceive the usefulness of the stove and revert back to traditional practice when the cook stove becomes non-functional therefore timely operation and maintenance are vital.

1.5 Project Start Date

The start date of the project activity is 06-October-2012.

The project activity relating to improved cook stove usage by the end user does not require any construction or significant pre-project implementation, nor financial commitment on the part of end user. The real action pertaining to the earliest date of handover of improved cook stoves to beneficiary (also considered as date of onset of GHG emission reductions) under the project activity is considered as the start date as per project start date definition under paragraph 3.7 of the VCS Standard.

The date of supply/ receipt of first lot of improved cookstoves from manufacturer to the regional office of the line department was considered as start date under the CDM registered PDD (evidenced through acknowledgement of the delivery receipt of the line department) as per CDM definition of Start Date. The start date referred to in the registered CDM-PDD was mirrored in the VCS PD(listed). Since the date does not resembles to handover of the cookstoves to beneficiary and does not result in onset of actual emission reduction therefore the same was not considered as start date under VCS mechanism and therefore revised with date of distribution/ handover of improved cookstoves to beneficiary. Project Crediting Period

The crediting period of the project activity is for 10 years (Fixed).

The length of the first crediting period is 06-October- 2012 to 05-October-2022 (both dates inclusive). The improved cookstoves distributions were carried out between 06-October-2012 to 17-December- 2012 amongst 14,400 beneficiaries.

As per errata and clarification, a project is deemed to have met the timelines where Verra confirmed (in writing, to the project proponent or an authorized representative) the project's eligibility on or before 4-February-2021. The listing process has been completed before 04-February-2021 and hence the errata and clarifications are not applicable

1.6 Project Location

The project is located in state Maharashtra, India.

Division: Aurangabad,

Districts: Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur Division: Amravati and

Districts: Buldhana, Akola, Washim, Amravati, Yavatmal, Division: Nagpur

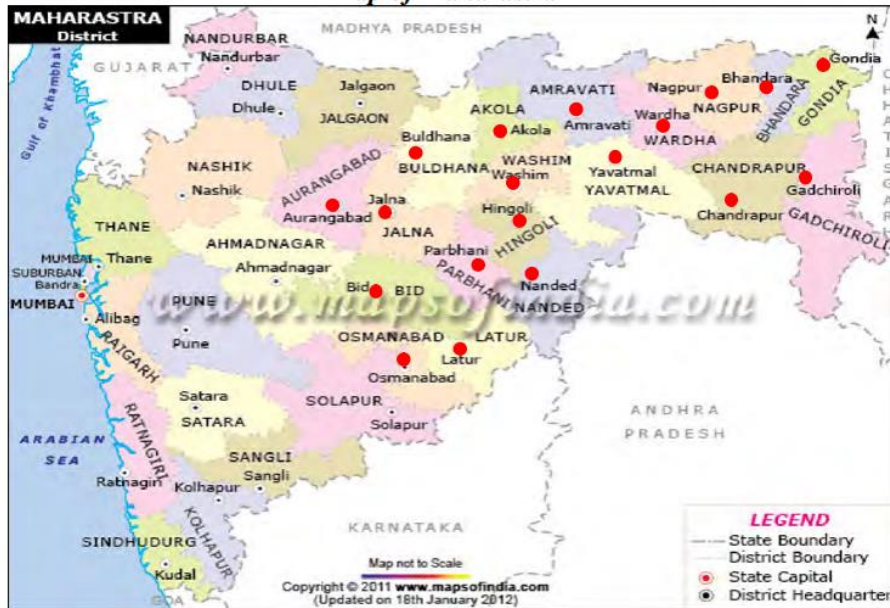
Districts: Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia

Division	District	Latitude	Longitude
Aurangabad	Aurangabad	19.00 – 20.00 °N	74.00 – 76.00 °E
	Jalna	19.10 - 21.30 °N	75.40 - 76.40 °E
	Parbhani	18.45 - 20.10 °N	76.13 - 77.39 °E
	Hingoli	19.43 °N	77.11 °E
	Beed	18.30 - 19.30 °N	74.50 - 76.60 °E
	Nanded	18.25 - 19.91 °N	77.00 - 78.41 °E

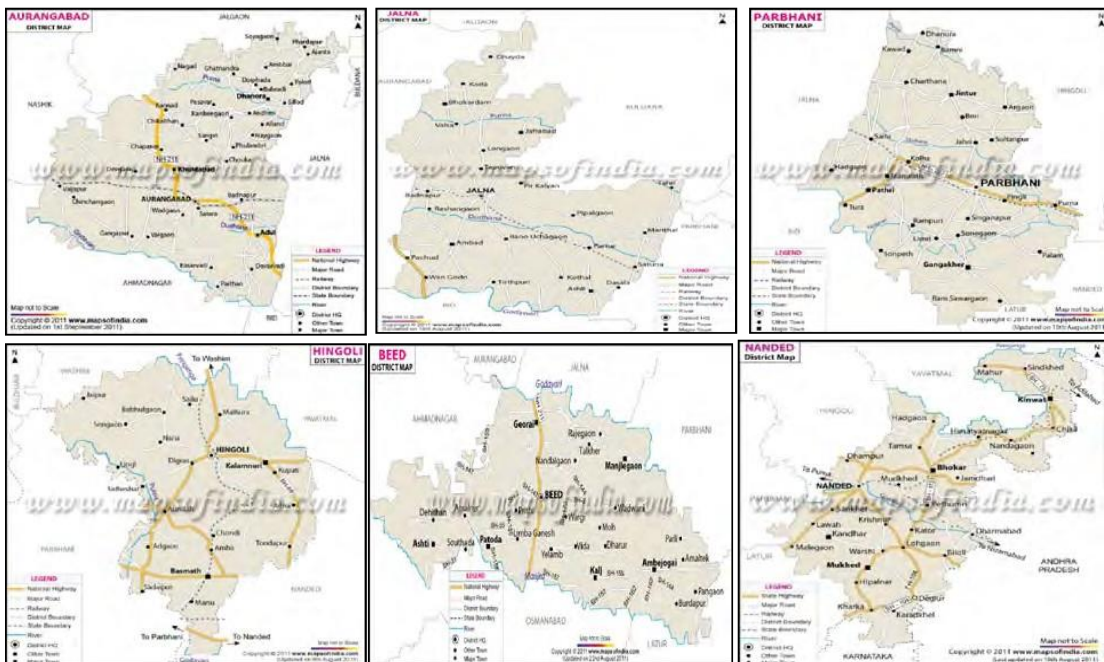
	Osmanabad	17.35 - 18.40 °N	75.16 - 76.40 °E
	Latur	17.75 - 18.75 °N	76.25 - 77.25 °E
Amravati	Buldhana	19.85 - 21.28 °N	75.95 - 76.81 °E
	Akola	19.85 - 21.26 °N	76.63 - 77.73 °E
	Washim	19.61 - 21.16 °N	76.70 - 77.40 °E
	Amravati	20.53 - 21.76 °N	76.61 - 78.45 °E
	Yavatmal	19.26 - 20.42 °N	77.18 - 79.98 °E
Nagpur	Wardha	20.30 - 21.35 °N	78.06 - 79.25 °E
	Nagpur	20.35 - 21.44 °N	75.15 - 79.40 °E
	Bhandara	20.65 - 21.63 °N	79.45 - 80.70 °E
	Chandrapu	18.40 - 20.50 °N	78.50 - 80.60 °E
	Gadchiroli	18.43 - 21.50 °N	79.45 - 80.53 °E
	Gondia	20.39 - 21.38 °N	79.27 - 80.42 °E

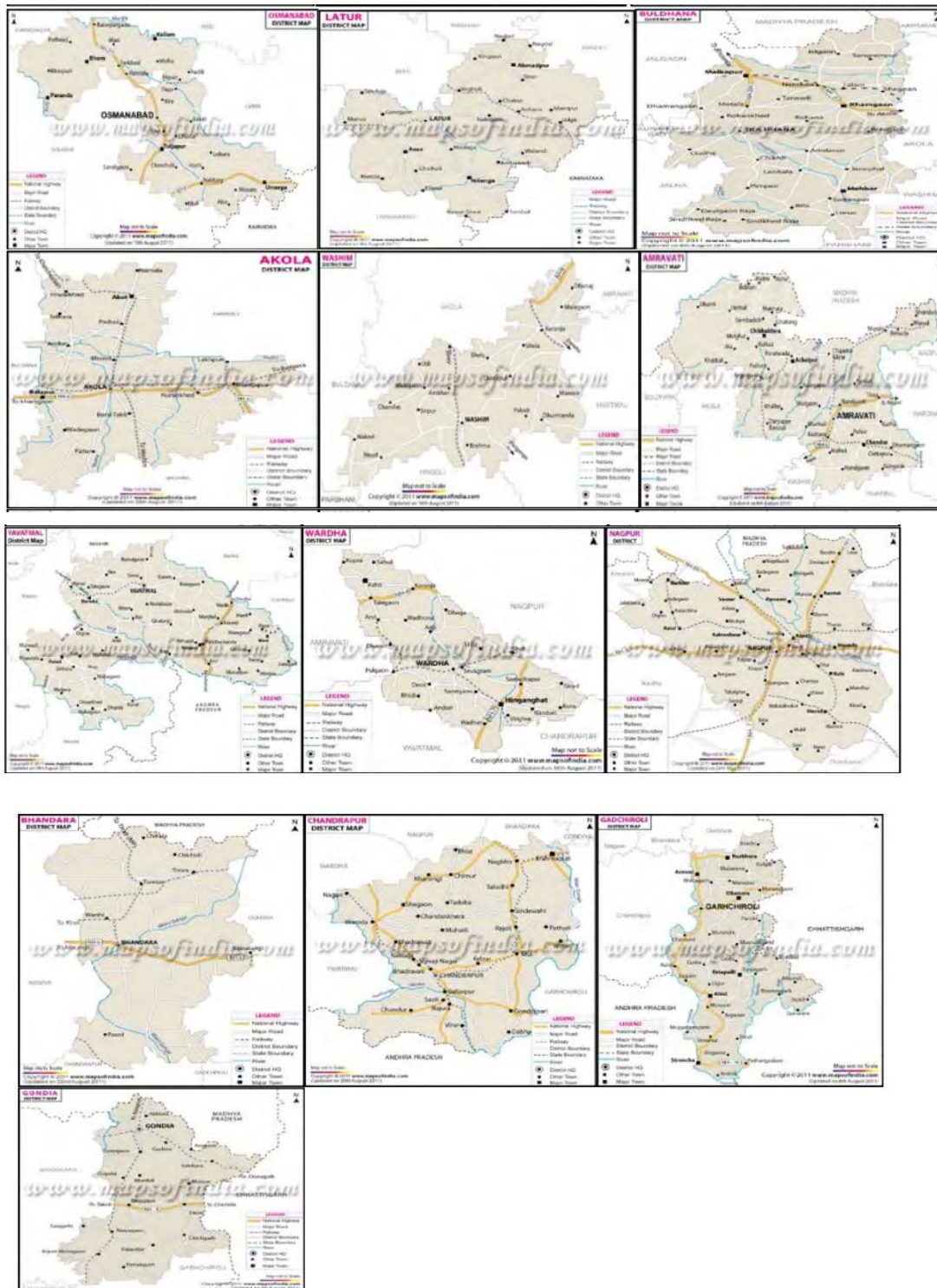


Map of India



Map of Maharashtra





Aurangabad			Jalna		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Daigavhan	Aurangabad	1	Baji Umrada Tanda	Jalna
2	Darakwadi	Aurangabad	2	Bapkal	Jalna
3	Daregaon	Aurangabad	3	Bathan Bk.	Jalna

Aurangabad			Jalna		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
4	Daulatabad	Aurangabad	4	Bethlam	Jalna
5	Demani	Aurangabad	5	Bhanunaik Tanda	Jalna
6	Devlai	Aurangabad	6	Bhatepuri	Jalna
7	Dharmapur	Aurangabad	7	Bhatkheda	Jalna
8	Dhawalapuri	Aurangabad	8	Bhilpuri Kh.	Jalna
9	Dhondkheda	Aurangabad	9	Bibi	Jalna
10	Dhopateshwar	Aurangabad	10	Borgaon	Jalna
11	Donwada	Aurangabad	11	Borkhedi	Jalna
12	Dudhad	Aurangabad	12	Bramhankheda	Jalna
13	Eklahara	Aurangabad	13	Chitli Putli	Jalna
14	Ekod	Aurangabad	14	Dahifal	Jalna
15	Fattepur	Aurangabad	15	Dambri	Jalna
16	Gadhe Jalgaon	Aurangabad	16	Daregaon	Jalna
17	Gadiwat	Aurangabad	17	Daregaon	Jalna
18	Gadiwat Tanda	Aurangabad	18	Deomurti	Jalna
19	Gandheli	Aurangabad	19	Dhagi	Jalna
20	Gangapur Jahagir	Aurangabad	20	Dhandegaon	Jalna
21	Gangapur Nehari	Aurangabad	21	Dhanora	Jalna
22	Garkheda	Aurangabad	22	Dhara	Jalna
23	Gavadari Tanda	Aurangabad	23	Dharkalyan	Jalna
24	Georai	Aurangabad	24	Dhawedi	Jalna
25	Georai Kubri	Aurangabad	25	Dudhana Kalegaon	Jalna
			26	Erandwadgaon	Jalna
			27	Ganeshpur	Jalna
			28	Gawali Pokhri	Jalna
			29	Ghanewadi	Jalna
			30	Ghetuli	Jalna
			31	Ghodegaon	Jalna
			32	Gokulnagar	Jalna
			33	Golapangri	Jalna
			34	Ahankar Devlgaon	Jalna
			35	Ambedkarwadi	Jalna
			36	Antarwala	Jalna

Parbhani			Hingoli		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Aland	Parbhani	1	Adgaon	Basmath
2	Alapur pandhari	Parbhani	2	Agdad	Basmath
3	Amadapur	Parbhani	3	Akoli	Basmath
4	Ambe takli	Parbhani	4	Amba	Basmath
5	Anandwadi	Parbhani	5	Ambanath	Basmath
6	Angalgaon	Parbhani	6	Aral	Basmath
7	Arvi	Parbhani	7	Asegaon	Basmath
8	Asola	Parbhani	8	Babhulgaon	Basmath
			9	Bagdad	Basmath
			10	Balegaon	Basmath
			11	Barepurwadi	Basmath
			12	Basmat	Basmath

			13	Bhendegaon	Basmath
			14	Bhogaon	Basmath
			15	Bhoripgaon	Basmath
			16	Borala	Basmath

Beed			Nanded		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Adgaon	Bid	1	Alegaon	Nanded
2	Aher Dhanora	Bid	2	Babulgaon	Nanded
3	Aher Nimgaon	Bid	3	Bhalki	Nanded
4	Aher wadgaon	Bid	4	Bhanagi	Nanded
5	Aherchincholi	Bid	5	Bhanpur	Nanded
6	Ambesawali	Bid	6	Bhayegaon	Nanded
7	Ambil Wadgaon	Bid	7	Bondhar Tarf Haveli	Nanded
8	Anandwadi	Bid	8	Borgaon Telang	Nanded
9	Anandwadi	Bid	9	Brahmanwada	Nanded
10	Andhapuri Ghat	Bid	10	Chikhali Bk.	Nanded
11	Anjanwadi	Bid	11	Chikhali Kh.	Nanded
12	Atharwan Pimpri	Bid	12	Chimegaon	Nanded
13	Aurangpur	Bid	13	Daryapur	Nanded
14	Awalpur	Bid	14	Dhangarwadi	Nanded
15	Babhal Khunta	Bid	15	Dhanora	Nanded
16	Babhalwadi	Bid	16	Dhoki	Nanded
17	Bahadarpur	Bid	17	Ekdara	Nanded
18	Bahirwadi	Bid	18	Elechpur	Nanded
19	Bakarwadi	Bid	19	Fattepur	Nanded
20	Balapur	Bid	20	Gadegaon	Nanded
21	Barhanpur	Bid	21	Gangabet	Nanded
22	Bedukwadi	Bid	22	Gopalchavdi	Nanded
23	Belapuri	Bid			
24	Belgaon	Bid			
25	Belkhandi	Bid			

Osmanabad			Latur		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Alni	Osmanabad	1	Chata	Latur
2	Ambehol	Osmanabad	2	Chikhal Thana	Latur
3	Ambejawalga	Osmanabad	3	Chikhurda	Latur
4	Ambewadi	Osmanabad	4	Chincholi Ballalnath	Latur
5	Ansurda	Osmanabad	5	Chincholi Rao	Latur
6	Arni	Osmanabad	6	Chincholi Raowadi	Latur
7	Bamani	Osmanabad	7	Dagadwadi	Latur
8	Baramgaon Bk.	Osmanabad	8	Dhakani	Latur
9	Baramgaon Kh.	Osmanabad	9	Dhanegaon	Latur
10	Bavi	Osmanabad	10	Dhanori	Latur
11	Bavi Dhoki	Osmanabad	11	Dhoki	Latur
12	Begada	Osmanabad	12	Dindegaon	Latur
			13	Ekurga	Latur
			14	Gadhawad	Latur

		15	Gangapur	Latur
		16	Ganjur	Latur
		17	Gategaon	Latur

Buldhana			Akola		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Adgaon	Khamgaon	1	Agar	Akola
2	Akoli	Khamgaon	2	Akhatwada	Akola
3	Ambetakali	Khamgaon	3	Akkalkot	Akola
4	Ambikapur	Khamgaon	4	Akola	Akola
5	Amsari	Khamgaon	5	Akoli Bk.	Akola
6	Antraj	Khamgaon	6	Akoli Kh.	Akola
7	Asa	Khamgaon	7	Aliyabad	Akola
8	Atali	Khamgaon	8	Amanatpur	Akola
9	Awar	Khamgaon	9	Ambikapur	Akola
10	Belkhed	Khamgaon	10	Anakwadi	Akola
11	Belura	Khamgaon	11	Anvi	Akola
12	Bhalegaon	Khamgaon	12	Apatapa	Akola
13	Bhandari	Khamgaon	13	Apoti Bk	Akola
14	Bhendi	Khamgaon	14	Apoti Kh	Akola
15	Bori	Khamgaon	15	Babhulgaon	Akola
16	Borjawala	Khamgaon	16	Badlapur	Akola
17	Bothakaji	Khamgaon	17	Bahadarpur	Akola
18	Bothakoli	Khamgaon	18	Bahirkhed	Akola
19	Chikhali Bk.	Khamgaon	19	Bakharabad	Akola
20	Chikhali Kh.	Khamgaon	20	Bhamhapuri	Akola
			21	Bhaurad	Akola
			22	Bhod	Akola
			23	Birsingpur	Akola
			24	Bondarkhed	Akola
			25	Bondarkhed	Akola
			26	Borgaon	Akola

Washim			Amravati		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Adgaon Kh.	Washim	1	Aliyabad	Amravati
2	Adgaon N. Kata	Washim	2	Amdapur	Amravati
3	Adoli	Washim	3	Amla	Amravati
4	Anjankhed	Washim	4	Angoda	Amravati
5	Ansing	Washim	5	Anjangaon bari	Amravati
6	Asola	Washim	6	Antora	Amravati
7	Atkali	Washim	7	Arhad	Amravati
8	Babhulgaon	Washim	8	Aurangpur	Amravati
9	Bhatumra	Washim	9	Bahilolpur	Amravati
			10	Bhagvanpur	Amravati
			11	Bhankheda Bk.	Amravati
			12	Bhankheda Kh.	Amravati
			13	Bodna	Amravati
			14	Borgaon	Amravati

			15	Brahman	Amravati
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Yavatmal			Wardha		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Akola	Arni	1	Ajagaon	Wardha
2	Amani	Arni	2	Alodi	Wardha
3	Amboda	Arni	3	Amaji Majara	Wardha
4	Anjankhed	Arni	4	Amboda	Wardha
5	Anjargaon	Arni	5	Aminpur	Wardha
6	Anji	Arni	6	Amla	Wardha
7	Arni	Arni	7	Anji	Wardha
			8	Asala	Wardha
			9	Ashrapur	Wardha
			10	Ashta	Wardha

Nagpur			Bhandara		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Ashta	Nagpur Rural	1	Ajimabad	Bhandara
2	Ashti	Nagpur Rural	2	Ambadi	Bhandara
3	Bahadura	Nagpur Rural	3	Amgaon	Bhandara
4	Bailwada	Nagpur Rural	4	Arjuni	Bhandara
5	Bajargaon	Nagpur Rural	5	Ashoknagar	Bhandara
6	Bamhani	Nagpur Rural	6	Basora	Bhandara
7	Bandhara	Nagpur Rural	7	Belgaon	Bhandara
8	Banwadi	Nagpur Rural	8	Berodi	Bhandara
9	Beltarodi	Nagpur Rural	9	Bhilewada	Bhandara
10	Besa	Nagpur Rural	10	Bhojapur	Bhandara
			11	Borgaon Bk.	Bhandara
			12	Borgaon Kh.	Bhandara
			13	Chandori	Bhandara
			14	Chandrapur	Bhandara
			15	Chicholi	Bhandara
			16	Chikhal Pahela	Bhandara
			17	Chikhali	Bhandara
			18	Chikhali Hamesha	Bhandara
			19	Chintapur	Bhandara
			20	Chowa	Bhandara
			21	Dabha	Bhandara
			22	Dawadipar	Bhandara
			23	Dawadipar	Bhandara
			24	Dawwa	Bhandara
			25	Dedmazari	Bhandara
			26	Dhargaon	Bhandara

Chandrapur			Gadchiroli		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
1	Adegaon	Chandrapur	1	Pavilasanpeth	Chamorshi
2	Agarzari	Chandrapur	2	Pettala Mal	Chamorshi

Chandrapur			Gadchiroli		
Sr.	Name of the Village	Taluka	Sr.	Name of the Village	Taluka
3	Ajayapur Raiyyatwari	Chandrapur	3	Potepalli Patch	Chamorshi
4	Ambhora	Chandrapur	4	Potepalli Rayyatwari	Chamorshi
5	Anturla	Chandrapur	5	Makepalli Mal	Chamorshi
6	Arwat	Chandrapur	6	Maler Chak	Chamorshi
7	Belsani	Chandrapur	7	Maler Mal	Chamorshi
8	Bor Rith	Chandrapur	8	Malkapur	Chamorshi
9	Borda Indarpawar	Chandrapur	9	Mangigaon	Chamorshi
10	Chak Borda	Chandrapur	10	Markanda Kansoba	Chamorshi
11	Chak Nimbala	Chandrapur	11	Markandadeo	Chamorshi
12	Chak Pimpal Khut	Chandrapur	12	Maroda	Chamorshi
13	Chandsurla	Chandrapur	13	Mohurli Mokasa	Chamorshi
14	Chandur	Chandrapur	14	Priyadarshani	Chamorshi
15	Chargaon	Chandrapur	15	Raipur	Chamorshi
16	Chichala	Chandrapur	16	Mudholi Rith	Chamorshi
17	Chichpali	Chandrapur	17	Mudholi Tukum	Chamorshi
18	Chincholi	Chandrapur	18	Murkhala	Chamorshi
19	Chorala	Chandrapur	19	Murkhala Chak	Chamorshi
20	Chorgaon	Chandrapur	20	Murmuri	Chamorshi
21	Datala	Chandrapur	21	Mutnur	Chamorshi
22	Dewada	Chandrapur	22	Nachangaon	Chamorshi
23	Dhanora	Chandrapur	23	Narendrapur	Chamorshi
24	Doni	Chandrapur	24	Navargaon	Chamorshi
25	Gawarala Rith	Chandrapur	25	Navegaon	Chamorshi
26	Ghanta Chauki	Chandrapur	26	Navegaon Mal	Chamorshi
27	Gondsawari	Chandrapur	27	Navegaon Raiyyatwari	Chamorshi
			28	Navgram	Chamorshi
			29	Navnitgram	Chamorshi
			30	Navtala Tukum	Chamorshi
			31	Netajinagar	Chamorshi
			32	Nikatwada	Chamorshi
			33	Nimgaon Riyyatwari	Chamorshi
			34	Palaspur	Chamorshi
			35	Pandhari Bhatal	Chamorshi
			36	Pavi-muranda	Chamorshi
			37	Rajangatta	Chamorshi
			38	Rajgopalpur	Chamorshi
			39	Rajur Bk	Chamorshi
			40	Rajur Kh	Chamorshi
			41	Ramala	Chamorshi

Gondia		
Sr.	Name of the Village	Taluka
1	Aasoli	Gondiya
2	Adashi	Gondiya
3	Ambhora	Gondiya
4	Arjuni	Gondiya
5	Badegaon	Gondiya
6	Bagholi	Gondiya

Gondia		
Sr.	Name of the Village	Taluka
7	Bajartola	Gondiya
8	Balamatola	Gondiya
9	Banathar	Gondiya
10	Barbaspura	Gondiya
11	Batana	Gondiya
12	Bhadutola	Gondiya
13	Bhadyatola	Gondiya
14	Bhagwattola	Gondiya
15	Bhanpur	Gondiya
16	Bijaitola	Gondiya
17	Birsi	Gondiya
18	Birsi	Gondiya
19	Birsola	Gondiya
20	Brahmantola	Gondiya
21	Chandanitola	Gondiya
22	Changera	Gondiya
23	Chargaon	Gondiya
24	Chhipiya	Gondiya
25	Chichtola	Gondiya
26	Chiramantola	Gondiya
27	Chulod	Gondiya

1.7 Title and Reference of Methodology

Consolidated baseline methodology for “Energy efficiency measures in thermal applications of non-renewable biomass”; AMS II-G, Version 04.0.0 Sectoral Scope: 04, EB 68.

1.8 Participation under other GHG Programs

Project has been registered with UNFCCC under Clean Development Mechanism program, Registration reference number is 9434.

The web link of the same is given below:

<https://cdm.unfccc.int/Projects/DB/RWTUV1356870786.16/view>

The Project is not rejected by any other GHG programs.

1.9 Other Forms of Credit

India is non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM with registration ID 9434. Project Proponent has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. Project Proponent would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. Project Proponent has also submitted an undertaking stating that they will not take REC benefits for the same Emission Reductions. Project Proponent has submitted undertaking for not availing other

forms of environmental credit for the same crediting period under consideration. Project Participant is not taking REC benefits for the same emission reductions.

1.10 Sustainable Development

The project contribution towards sustainable development is established in line with the sustainable development indicator framed by the host country DNA:

Social benefits:

1. Reduces drudgery of women and children of rural areas (due to reduced fuel wood use) by reducing time spent and distance travelled for fuel wood collection. Reduction in firewood requirement helps in spending more time in productive activities such as education, employment etc.
2. Improves overall health (particularly diseases related to respiratory system) of women and children by reducing smoke in the kitchen.

Environmental benefits:

1. Improves the local environment by reducing rate of forest degradation /deforestation in the project area. Conservation of forest is not only reduce non-renewable biomass demand and also reduce soil erosion and loss of biodiversity as a consequence of deforestation.
2. Reduces emission of black carbon to the atmosphere.
3. Reduces Green-house gas emissions.

Economic benefits:

1. Employment opportunities for local communities involved in monitoring, training of users, undertaking periodic maintenance and post life time replacement.
2. Reduces the expenditure involved in the pre project scenario for purchase of fuel wood.

Technological benefits:

1. Introduction of new technology to the rural communities.
2. Knowledge transfer to trainers including technicians for pertaining training to users, maintenance of system.
3. Demonstration of a successful project at household level creates replication potential in other states and countries.

In view of the above, the project proponent considers that, the project activity profoundly contributes towards sustainable development of the region as well as of the nation.

2 SAFEGUARDS

2.1 No Net Harm

According to the Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S .O.1533(E), dated 14-September-2006; the project activity of utilization of Improved Cook stove for cooking in rural households does not require environmental impact assessment study to be carried out.

2.2 Local Stakeholder Consultation

The project proponent has opted to develop CDM project for distribution of cook stoves in and across the different location in the state across different time frame. Based on the number of cook stoves aimed to be distributed under the planned program 30 phases are planned. Since the household to be covered in each phase are homogeneous owing to the household being identified by the Rural Development Department, Government of Maharashtra based on the level of poverty judged on the basis of the thirteen point criteria figured out by the Ministry and the total budgetary provision across the year. Because of the limited budgetary provision across a financial year a fixed number of populations can only be covered amongst the group leaving the others to be covered in subsequent time frame. Because of the similar category of population, the project proponent decided to carry out the stake holder's consultation for all the planned phases in a single go, so that the people from different geographical locations could able to respond to such meeting. The location for the consultation program is so selected that the particular location of the consultation represents the particular division or region of Maharashtra under whose jurisdiction several districts come into. As such the locations for the consultation program are selected and newspaper advertisements are published both in English and regional daily about the program so that the peoples from the particular region can attend the consultation program which they feel nearby. Local stakeholders' meetings were conducted to take public comments. Six stakeholder meetings were conducted at Nasik, Pune, Nagpur, Latur, Sangli and Washim districts of Maharashtra. The details of meetings are

Date of Meeting	District	Meeting Venue
2nd February 2012	Nasik	Siaram Indrayani Housing Society, Takli Rd, Nasik– 06
2nd February 2012	Pune	G K Energy Marketers Pvt Ltd. Lokmanya Nagar, LBS Rd, Pune
2nd February 2012	Nagpur	246 KumbharPura, Jagnath Rd Gandhi Bag, Nagpur
2nd February 2012	Latur	Sut Mil Rd, Pushkar Residency, Latur
3rd February 2012	Sangli	Khan Bag, Jai Bhavani Chowk, Sangli
3rd February 2012	Washim	Dr. Jirvankar Bhar Jahangir Resod, Washim

Along with public notices published in newspapers namely The Free Press Journal, Mumbai and Navshakti, Mumbai on 26th January 2012, notification of the meetings was sent through invitations, letters and personally to various categories of stakeholders to attend the stakeholder meeting. The meeting was conducted in regional language –Marathi and English. The discussion points of the meeting included purpose of the consultation, background and role of bundling agency and manufacturer under this project, description of the project, demonstration of improved cook stove, about climate change and CDM, impact of climate

change, global environment scenario, contribution of the project towards sustainable development of the country by the representative from bundling agency and Improved Cook stove manufacturer. After a detailed elaborative discussion on the project, the stakeholders were asked to provide their comments /feedbacks /suggestions on the project.

The cook stoves in this project activity (Eighteenth Phase) are distributed in Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts of Maharashtra which lies in the Aurangabad, Amravati and Nagpur division jurisdiction. The stakeholders consultation conducted on 2nd and 3rd February 2012 at Nagpur, Latur and Washim district in Aurangabad, Amravati and Nagpur covered this project location and the consultation was also conducted before webhosting of the PDD. The meetings were attended by members from various backgrounds as listed below –

Participant of Nagpur meeting –

Sl. No.	Name of Person	Designation
1	Gopal R Kabra	CEO, GKEMPL
2	Raju Babasaheb Kadam	Farmer
3	Sopan Sham Kale	Student
4	Jitesh Gawale	Working professional
5	Kartik Kumar	Student
6	Imran Munjaver	Businessman
7	Makrand Mane	Working professional
8	Rahul Awtade	Businessman
9	Raju Namdev Pagar	Working professional
10	Sanjay Shinde	Businessman

Participant of Latur meeting –

Sl. No.	Name of Person	Designation
1	Vikram Kale	Sr. Operator
2	Namdev Kale	Student
3	Ramesh Padval	Farmer
4	Apparao Gonje	Working professional
5	Dinesh Kamble	Farmer
6	Goremama	Working professional
7	Pritesh Choudhury	Working professional
8	Vayjanath Navgire	Working professional
9	Papu Jagdale	Working professional
10	Somnath Lohar	Working professional
11	Shivaji Karad	Working professional
12	Somanath Chandane	Farmer
13	Kondeba Manere	Working professional
14	Rajkumar Shinde Working	Working professional
15	Vishal Pandit	Farmer

Participant of Washim meeting –

Sl. No.	Name of Person	Designation
1	Chandrakant Jaising Bhadre	Farmer
2	Jaganath Kadam	Working professional
3	Anand Bhanudass Pawar	Working professional
4	Appa Navgire	Working professional
5	Gautam Suryavanshi	Working professional
6	Rangarao Suryavanshi	Farmer
7	Dhanjay Suryavanshi	Farmer
8	Bhaskar Bhadre	Farmer
9	Satish Jagtap	Student
10	Ganesh Bhosale	Working professional
11	Sachin Jagdale	Working professional
12	Ashok Ghorpade	Working professional
13	Dhanjay Sanjekar	Working professional
14	Padmakar Meshram	Farmer
15	Vijay Navalkar	Farmer
16	Amol Barkue	Farmer
17	Prakash Subash Jhande	Working professional
18	Shaji Rathod	Working professional
19	Madhular Rathod	Local representative
20	Milind Bondge	Local representative
21	Mustaffa Mukadam Shekh	Local representative
22	Prithviraj Suryavanshi	Marketing Executive, Vikram Stoves

The overall response from the local stakeholders on the project was encouraging and positive. No adverse or negative comments or response received in the meeting. The participants of the meeting had not raised any significant concerns nor seek any clarification related to potential impacts of the project activity or any other issue. The project as a whole gives positive impression towards the issue of sustainable development of the country.

The stakeholder's comments sought during the meeting in following manners –

- The stakeholders were invited to ask any clarification or information on the project activity during the meeting.
- Evaluation form / questionnaire were asked to fill in by the stakeholders interested to give their inputs on the project activity.

The evaluation forms were analyzed for the comments and no negative comments is being found.

The summary of stakeholders comment received during stakeholders meeting of Nagpur, Latur and Washim are summarised as below –

Queries	Reply
The benefits that, users of Improved Cook	Mr. Kabra of GKEMPL explained that, use of improved cook stoves for household cooking will reduce indoor air pollution, cooking time and also fuel-wood consumption due to higher efficiency. Moreover,

stove will receive from the project activity? · Whether the users have to file an application to any office to consider their system under the project activity?	the users of improved cook stoves will get free maintenance service and free of cost replacement of the system at the end of its lifetime with new improved cook stove. In reply to the next query, he clarified that, users need not to apply to anywhere to be considered under the project. The representative of GKEMPL will contact to every users for necessary due diligence
Time required for the CDM project development.	Responding to the query Mr. Kabra replied that, time line for CDM project development and registration is around one year but, the revenue inflow will take at least another one year.
Quantum of CER to be generated from each Improved Cook stove system?	Addressing to the query Mr. Kabra, GKEMPL replied that, approximately about 1.10 CER will be generated in every year by use of each Improved Cook stove

Queries	Reply
Tasks to be undertaken by the users of Improved Cook stove for successful receipt of CDM revenue and benefit to be received by them in return.	Addressing to the query Mr. Kale representative of Vikram stoves described the monitoring plan, the parameters to be monitored and steps to undertake by the user. Further, he continue with clarification that, Improved cook stove users will get free maintenance service and free of cost replacement of the Improved Cook stove system will be given at the end of lifetime during the crediting period.
How long can the user obtain the CDM benefit	Responding to the query Mr. Vikram Kale representative of Vikram stoves mentioned that, improved cook stove systems considered under the project will receive free of cost maintenance service for 10 years from date of registration.

Queries	Reply
Whether there is any possibility of negative impact to the health of the user or to the local environment?	The representative from Vikram Stoves explained that, there will be no detrimental effect on user's health due to the project activity as it is contributing in pollution reduction. Rather, the project is reducing fire-wood consumption through improved combustion technology and thereby reducing deforestation and green-house gases emission. Apart from this, the project is reducing indoor air pollution by means of smoke reduction.
The benefits that users of Improved Cook stove will receive from the project activity?	Mr. Suryavanshi representative from Vikram Stoves replied that, use of improved cook stoves for household cooking will reduce the indoor air pollution, cooking time and also fuel-wood consumption due to higher efficiency. Moreover, the users of improved cook stoves will get free maintenance service and free of cost replacement of the system at the end of its lifetime.
Clarification whether the plants to be installed in future will get this benefit?	Addressing to the query Mr. Suryavanshi, representative from Vikram Stoves replied that, all the improved cook stoves distributed after a particular date will be considered for carbon credit benefit under these projects. But, the no. of systems to be considered under the projects depends upon the threshold limit as given by the UNFCCC. Therefore, may be all stoves cannot be considered.
How long the user will get this benefit?	Responding to the query Mr. Suryavanshi representative from Vikram Stoves replied that, ICS systems considered under the

	project will receive free of cost maintenance service for 10 years post registration.
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The grievance registers have been placed at each district office for the stakeholders and the end users. There have been no grievances received during the current monitoring period.

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The improved cook stove conceived under the project activity is MNRE and BIS (Bureau of Indian Standard) approved state of art and environmentally sound technology. The improved cook stove is manufactured in accordance to IS13152 (Part 1): 1991 (Solid Biomass – Chulha Part 1(Metallic))¹³. The standard has been prepared in line with the national approach towards fuel conservation, better environment, mitigating health hazards and loss of forest cover caused by burning of wood as cooking fuel and therefore, can be conceived as an environmentally sound technology for combustion of solid biomass for the purpose of cooking. Moreover, the materials used in manufacturing of the cook stove are of iron and steel which is recyclable after end use and hence, considered to be environmentally safe after lifetime also. Although the ICS distributed under the current phase pertains to different batch of manufacturing, but since the products are being manufactured complying to a particular performance standard (IS13152 (Part 1):1991) the quality output for each unit of products complies to a minimum level.

The cook stove distributed under the project activity is a portable, single-pot stove without chimney, natural draft and metal made stove specifically suitable for combustion of solid biomass. The cook stove broadly comprises of a combustion chamber, top plate for holding the utensils, grate for holding fuel during combustion and bottom plate that facilitates ventilation of air. The combustion chamber is cylindrical shaped and made up of mild steel. One side of the chamber of improved cook stove is opened for feeding of fuel. The chamber top plate is die cast and made up of cast iron.

¹³ The Standard has been prepared by Indian Standard body in line with the national approach towards fuel conservation and better environment, mitigating Health hazards and drudgery and loss of forest cover caused by burning of wood as cooking fuel (Forward: Indian Standard Solid Bio-Mass, Chulha – Specification Part 1 Portable (Metallic))

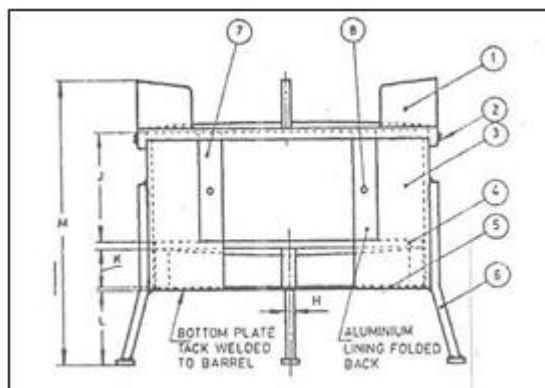
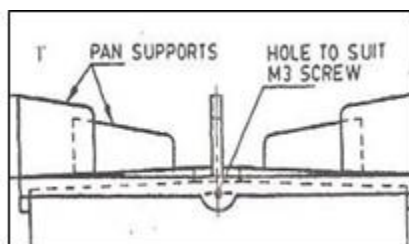
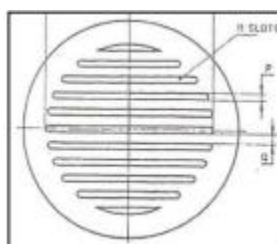


Diagram of Improved Cook Stove

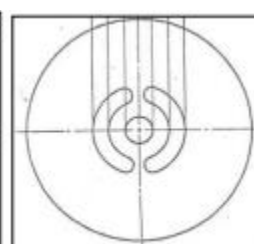
1. Top plate,
2. Screw,
3. Barrel,
4. Grate,
5. Bottom Plate,
6. Legs,
7. Aluminium Lining and
8. Rivet



Top Plate



Grate



Bottom Plate



Material used for manufacturing of each component of the cook stoves are:

Component	Material
Top plate	Cast iron
Grate	Cast iron
Barrel	Mild steel
Bottom Plate	Mild steel

Lining	Aluminum
Perforated Sleeve	Mild steel
Handle	Mild steel
Pan Support	Mild steel sheet-flat-rod
Legs	Mild steel sheet and rod

Life time

The operational lifetime of the cook stove is 5 years 00 months. As per manufacturer authorization the operational life of improved cookstoves is over seven years, however beyond five years the operational efficiency drops below the rated efficiency and hence was considered as operational life time in the registered PDD.

Decline in the cook stove efficiency as assessed through periodic efficiency testing is being reported and considered as part of emission reduction calculation.

Replacement of Improved Cookstoves

Replacement of ICS was scheduled to be carried out

(a) in case of breakage/ dismantle of ICS during the operational period – on receipt of complaint the localised service providers of the project proponent visits the beneficiary with backup cook stoves (ICS) and provides the beneficiary with backup stoves if the service provider fails to address the issues locally. The malfunctioned ICS post collected from beneficiary is thereafter sent to the company workshop in case of possibility of repair. In case the ICS couldn't be repaired beneficiary are to be provided with new ICS.

(b) Observed requirement of complex repair- In case the maintenance team of the project proponent during scheduled O&M observes requirement of complex repairs the team may on discretion replace the existing cookstoves with a new one or a backup one. In such case the beneficiary is provided with backup new ICS the same are to be replaced with the repaired one operating at the desired satisfaction level of beneficiary.

(c) Post assessment of operational efficiency in the last year after the elapse of scheduled lifetime of ICS from the date of distribution.

During the current monitoring period of 5 years there has been no instances of replacement of improved cook stoves, therefore no such impact on emission reduction calculation due to increase of cook stoves efficiency.

Operation and maintenance

Operation and maintenance of Improved cook stoves are carried out periodically by authorised representative of project proponent (manufacturer of improved cook stoves). The authorized representative of the project proponent during the annual (periodic) maintenance, also motivates and persuades the beneficiaries for continuation of ICS usages for cooking of all meals towards reducing the health impact of the family especially the women and children in case of usage of traditional cook stoves and thereby ensuring the restoration of operation of ICS.

Approach for assessing share of Improved cookstoves users for estimation of emission reduction

1. The number of beneficiaries using Improved cook stoves during a particular monitoring period are assessed based on record of operation and maintenance, maintained by project proponent pertaining to discontinued users.
2. Annual third-party sample survey is being carried out to assess the share of beneficiaries using improved cookstoves. During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users.

The survey observed/found most of the beneficiaries to have fully discontinued the usage of traditional cookstoves and have even dismantled the traditional cookstoves.

Around 5-10% of beneficiaries during a particular crediting period have been assessed to have partially used traditional cookstoves (as deduced from the beneficiary survey) due to customary practice/festival or to manage guests. Considering the perceptive response of the beneficiaries regarding the number of day of functioning of traditional cookstoves, it is conservatively considered that the number of days of use of improved cookstoves for those particular beneficiaries who have used traditional cookstoves as zero/nil. Although such consideration negatively impacts the annualized emission reductions estimate but such consideration is being conservatively considered for the purpose of calculation.

3.2 Deviations

3.2.1 Methodology Deviations

Not Applicable

3.2.2 Project Description Deviations

Not Applicable

3.3 Grouped Projects

Not Applicable

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	B _{old}
Data unit	tonnes/ household/year

Description	Quantity of woody biomass used in absence of the project activity
Source of data	Teri Energy Data Directory Yearbook for 2010
Value applied	1.469
Justification of choice of data or description of measurement methods and procedures applied	The study as per Wood Fuel Trade in India – Food and Agricultural Organisation of the United Nation, July 2001, per capita per day biomass consumption of 1.52 kg and 5.6 kg of fuel wood consumption per household per day. Annual consumption per household per day is therefore estimated at 2.044 tonnes. Further, the publication of TERI Energy Data Directory and Yearbook2010 outlines that, the per capita per month consumption of fire wood in Maharashtra at 25.51 kg/month/capita. With average population size of 4.8 persons/household/the annual consumption of firewood is estimated at 1.469 tonnes/year/household. Being the annual household fuel consumption data estimated on the basis of the TERI Energy Data Directory is most conservative amongst the available fuel wood consumption figure available secondarily the value of 1.469 tonnes/household/year is considered for estimation of By, savings.
Purpose of Data	Quantity of biomass utilization is used to estimate the quantum of biomass that will be saved in the project scenario after factoring into the improvement of efficiency.
Comments	The maximum value of Bold is fixed at ex-ante. Factors calculated based on the number of days of traditional cook stove usage and number of days of improved cook stoves usage is multiplied with Bold to estimate the Bold to be used for emission reduction calculation.

Data / Parameter	η_{new}
Data unit	%
Description	Efficiency of the cook stove being deployed as a part of the project activity
Source of data	Test report issued by Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur
Value applied	29.88%
Justification of choice of data or description of	Thermal efficiency test carried out as per water Boiling Test Protocol specified as per IS13152 protocol.

measurement methods and procedures applied	
Purpose of Data	Efficiency of the improved cookstoves is used to estimate the saving in fuel wood. (The factor is not fixed ex-post and estimated based on monitored efficiency of sample number of cookstoves)
Comments	The value of Efficiency is monitored on an annual basis and vintage wise.

Data / Parameter	B_{y,savings}
Data unit	tonne/household/year
Description	Quantity of woody biomass saved due to implementation of the project activity
Source of data	Calculated
Value applied	0.9774
Justification of choice of data or description of measurement methods and procedures applied	B_{y, savings} is calculated using equation $B_{y, savings} = B_{old} * (1 - \eta_{old} / \eta_{new})$ $= 1.469 * (1 - 0.1 / 0.2988)$ $= 0.9774 \text{ tonne /household/year}$
Purpose of Data	Fuel wood saving is calculated for estimation of emission reduction.
Comments	The efficiency of the improved cook stoves is monitored on an annual basis based on the sample survey and if appliances are found to be operational with lower efficiency then, the actual efficiency determined during monitoring is considered to calculate emission reduction.

Data / Parameter	Energy Saving per cook stove or household
Data unit	GWh _{th} /household/year
Description	Energy saving per cook stove due to improved efficiency of the distributed cook stove
Source of data	Calculated
Value applied	0.00407
Justification of choice of data or description of measurement methods and procedures applied	Energy Saving = B_{y, saving} * NCV_{biomass} $= B_{old} * (1 - \eta_{old} / \eta_{new}) * NCV_{biomass}$ $= 1.469 * (1 - 0.1 / 0.2988) * 0.0150$ $= 0.01466 \text{ TJ /household /year}$

	= 0.00407 GWhth/household/year = 4.073 MWhth/ household/year = 1.358 MWhe / household/year Note: Value of $NCV_{biomass}$ is considered as per Paragraph 5 of the applicable methodology AMS -II. G. Version 04; IPCC default value for fuel wood i.e. 0.015 TJ/tonne is chosen.
Purpose of Data	The data is used to assess the applicability condition of the project under micro small scale guidelines and also de-bundling.
Comments	-

Data / Parameter	$F_{NRB,y}$
Data unit	-
Description	The factors relates to the fraction of non-renewable biomass
Source of data	Calculated using secondary sources
Value applied	87.9%
Justification of choice of data or description of measurement methods and procedures applied	The fraction of non-renewable biomass is calculated based on the fuel wood demand and supply of biomass across the state of Maharashtra.
Purpose of Data	Data is used for estimation of emission reduction.
Comments	-

4.2 Data and Parameters Monitored

Data / Parameter	η_{new}
Data unit	%
Description	Efficiency of the system being deployed in project activity
Source of data	Third party efficiency test report.
Description of measurement methods and procedures to be applied	The sample systems tested as per Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991 for solid biomass cook stove. The testing is carried out on annual basis of representative sample. The minimum value of tested efficiency or 29.88% which so ever is lower is used to calculate emission reduction of the systems for particular year of operation.
Frequency of monitoring/recording	Efficiency of the improved cookstoves under operation is monitored across sample system on an annual basis

Value monitored	Period	Date of Monitoring	Number of Improved cookstoves assessed	Minimum efficiency of the lot
	06 Oct 12 – 05 Oct 13	25-11-2013, 27-11-2013, 06-12-2013, 02-12-2013, 09-01-2014, 11-01-2014, 13-01-2014, 13-01-2014, 15-01-2014, 15-01-2014, 11-01-2014, 09-01-2014, 07-12-2013, 05-12-2013, 02-12-2013, 01-12-2013, 29-11-2013, 27-11-2013, 25-11-2013	40	29.04%
	06 Oct 13 – 05 Oct 14	09-01-2015, 27-11-2014, 06-12-2014, 02-12-2014, 25-11-2014, 11-01-2015, 13-01-2015, 13-01-2015, 15-01-2015, 15-01-2015, 11-01-2015, 09-01-2015, 25-11-2014, 27-11-2014, 29-11-2014, 01-12-2014, 02-12-2014, 05-12-2014, 07-12-2014	40	28.70%
	06 Oct 14 – 05 Oct 15	13-01-2016, 02-12-2015, 09-01-2016, 13-01-2016, 11-01-2016, 06-12-2015, 25-11-2015, 27-11-2015, 11-01-2016, 15-01-2016, 09-01-2016, 15-01-2016, 07-12-2015, 02-12-2015, 01-12-2015, 05-12-2015, 29-11-2015, 27-11-2015, 25-11-2015	40	28.41%
	06 Oct 15 – 05 Oct 16	06-12-2016, 09-01-2017, 25-11-2016, 27-11-2016, 02-12-2017, 13-01-2017, 11-01-2017, 13-01-2017, 07-12-2016, 09-01-2017, 05-12-2017, 02-12-2016, 15-01-2016	40	27.90%

	2017, 15-01-2017, 11-01-2017, 27-11-2016, 25-11-2016, 01-12-2016, 29-11-2016																					
	06 Oct 16 – 05 Oct 17	25-11-2017, 11-01-2018, 13-01-2018, 02-12-2017, 01-12-2017, 29-11-2017, 27-11-2017, 25-11-2017, 07-12-2017, 05-12-2017, 13-01-2018, 27-11-2017, 06-12-2017, 02-12-2017, 09-01-2018, 15-01-2018, 15-01-2018, 11-01-2018, 09-01-2018	40	25.99%																		
Monitoring equipment	1. Digital Thermometer 2. Weighing scale																					
QA/QC procedures to be applied	Efficiency of the system is tested by third party agency on principle of the Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991. The number of sample system to be inspected is estimated in accordance to “ Guidelines for Sampling and Surveys for Project Activities and Programme of Activities ” Version 02, EB 69 Annex 5 and procedure for sample size calculation is specified in Section B.7.2 of the CDM PDD.																					
Purpose of the data	The value of the efficiency is used to calculate the $B_{y, savings}$ used for ex-post estimation of emission reduction.																					
Calculation method	Heat utilized = $(n-1) \times (W \times 0.214 + w) \times (t_2 - t_1) + (W \times 0.214 + w) \times (t_3 - t_1)$ kcal Heat Produced = $[(X \times c_1) + (x \times d / 1000 \times c_2)]$ kcal Thermal Efficiency = Heat utilised/ Heat Produced $\times 100$ Where <table><tr><td>w</td><td>Mass of water in vessel, in kg</td></tr><tr><td>W</td><td>Mass of the vessel complete with lead and stirrer, in kg</td></tr><tr><td>X</td><td>Mass of the fuel consumed, in kg</td></tr><tr><td>c₁</td><td>Calorific value of wood in kcal/kg</td></tr><tr><td>x</td><td>Volume of the kerosene consumed, in ml</td></tr><tr><td>c₂</td><td>Calorific value of kerosene in kcal/kg</td></tr><tr><td>d</td><td>Density of kerosene, in g/ml</td></tr><tr><td>t₁</td><td>Initial temperature of the water, in °C</td></tr><tr><td>t₂</td><td>Final temperature of the water, in °C</td></tr></table>				w	Mass of water in vessel, in kg	W	Mass of the vessel complete with lead and stirrer, in kg	X	Mass of the fuel consumed, in kg	c ₁	Calorific value of wood in kcal/kg	x	Volume of the kerosene consumed, in ml	c ₂	Calorific value of kerosene in kcal/kg	d	Density of kerosene, in g/ml	t ₁	Initial temperature of the water, in °C	t ₂	Final temperature of the water, in °C
w	Mass of water in vessel, in kg																					
W	Mass of the vessel complete with lead and stirrer, in kg																					
X	Mass of the fuel consumed, in kg																					
c ₁	Calorific value of wood in kcal/kg																					
x	Volume of the kerosene consumed, in ml																					
c ₂	Calorific value of kerosene in kcal/kg																					
d	Density of kerosene, in g/ml																					
t ₁	Initial temperature of the water, in °C																					
t ₂	Final temperature of the water, in °C																					

	t_3	Final temperature of the water in the last vessel at the completion of the test, in °C
	n	Total number of vessels used
	0.214	Specific heat of aluminium in kcal/kg°C
Comments	As a part of the third party sample assessment of the operational efficiency of improved cookstoves, the minimum of the assessed efficiency from amongst the forty system tested below 29.88% is considered as a efficiency to be considered for purpose of emission reduction calculation in place of 29.88% (rated efficiency). Although the ICS distributed under the current phase pertains to different batch of manufacturing, but since the products are being manufactured complying to a particular performance standard (IS13152 (Part 1):1991) the quality output for each unit of products complies to a minimum level. Moreover, the distribution is carried out during same period amongst homogeneous beneficiary segment, moreover the onset of operations of ICS has been kept at the same point of time. Therefore, as per the guidelines specified under the registered PDD Simple Random sampling methods were selected. The data estimated is archived both in paper and electronic spread sheet whereby the paper and the electronic form of the documents is maintained by the Project Participant for period of two year and electronic data is maintained till 2 years after the last issuance.	

Data / Parameter	No. cook stoves in use
Data unit	Number
Description	The number of improved cook stoves distributed to households under the project activity and under operation.
Source of data	Third party agency survey report and database managed by the Project Participant (the end user agreement)
Description of measurement methods and procedures to be applied	The monitoring consists of third-party survey of representative sample on annual basis to evaluate the number of systems in operation. The percentage of cook stove in usage as estimated from the survey result is multiplied with the total number of cook stove to determine number of cook stove in operation and to be considered for the purpose of emission reduction calculation.
Frequency of monitoring/recording	Number of improved cookstoves under operation is monitored annually based on sample survey
Value monitored	During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of

traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users for the purpose of estimating emission reduction.

Period	No. of Dis-continued user	Date of Survey	Number of beneficiaries surveyed	% of partial users	% of users used ICS only
06 Oct 12 – 05 Oct 13	0	25-11-2013, 27-11-2013, 06-12-2013, 02-12-2013, 09-01-2014, 11-01-2014, 13-01-2014, 13-01-2014, 15-01-2014, 15-01-2014, 11-01-2014, 09-01-2014, 07-12-2013, 05-12-2013, 02-12-2013, 01-12-2013, 29-11-2013, 27-11-2013, 25-11-2013	160	5.00%	95.00%
06 Oct 13 – 05 Oct 14	0	09-01-2015, 27-11-2014, 06-12-2014, 02-12-2014, 25-11-2014, 11-01-2015, 13-01-2015, 13-01-2015, 15-01-2015, 15-01-2015, 11-01-2015, 09-01-2015, 25-11-2014, 27-11-2014, 29-11-2014, 01-12-2014, 02-12-2014, 05-12-2014, 07-12-2014	160	6.25%	93.75%
06 Oct 14 – 05 Oct 15	0	13-01-2016, 02-12-2015, 09-01-2016, 13-01-2016, 11-01-2016, 06-12-2015, 25-11-2015, 27-11-2015, 11-01-2016, 15-01-2016, 09-01-2016, 15-01-2016, 07-12-2015, 02-12-2015,	160	7.50%	92.50%

			01-12-2015, 05-12-2015, 29-11-2015, 27-11-2015, 25-11-2015			
	06 Oct 15 – 05 Oct 16	0	06-12-2016, 09-01-2017, 25-11-2016, 27-11-2016, 02-12-2017, 13-01-2017, 11-01-2017, 13-01-2017, 07-12-2016, 09-01-2017, 05-12-2016, 02-12-2016, 15-01-2017, 15-01-2017, 11-01-2017, 27-11-2016, 25-11-2016, 01-12-2016, 29-11-2016	160	9.38%	90.63%
	06 Oct 16– 05 Oct 17	0	25-11-2017, 11-01-2018, 13-01-2018, 02-12-2017, 01-12-2017, 29-11-2017, 27-11-2017, 25-11-2017, 07-12-2017, 05-12-2017, 13-01-2018, 27-11-2017, 06-12-2017, 02-12-2017, 09-01-2018, 15-01-2018, 15-01-2018, 11-01-2018, 09-01-2018	160	12.50%	87.50%
Number of Improved Cook stoves distributed – 14,400						
Monitoring equipment	-					
QA/QC procedures to be applied	The project proponent obtains an authorization from each /group of the household in form of end user agreement for processing of carbon revenue. The database containing all information of the end user agreement is maintained in a central server located with project participant and accessible to the project team at different locations. During the time of verification, the VVB can verify the list of beneficiaries who has signed the end user agreement (for which the emission reductions are claimed).					
Purpose of the data	For estimation of baseline emission					
Calculation method	Share of beneficiaries using Improved cookstoves = $\frac{160 - \text{no of partial users}}{160}$					

Comments	The percentage of the representative sample using the improved cook stove determined from the sample survey is used to calculate the total number of cook stoves in operation. The survey report is kept and maintained by the project proponent for the period of two years after the last issuance. Since, the distribution of Improved cook stoves is carried out during same period amongst homogeneous beneficiary segment, and moreover the onset of operations of ICS has been kept at the same point of time. Therefore, as per the guidelines specified under the registered PDD Simple Random sampling methods were selected.
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Data / Parameter	Days of Operation			
Data unit	Number			
Description	The parameter relates to the number of days for which the cook stove in operation during the particular year			
Source of data	Monitoring Database			
Description of measurement methods and procedures to be applied	The emission reduction as against the cook stove is calculated when the system is being delivered to the end user, the end user initiated its operation and the end user agreement is being signed. Since, the emission reduction is based on the days of operation therefore, it is important to monitor the number of days of non-functioning. The days of non-functioning is estimated based on the number of days between the date of complaint as against damage or non- functioning received and date of repair or replacement. The information is maintained in form of database and archived. $\text{Number of days of operation} = 365 - \text{Average number of days the cook stove was non-functional}$ The number of non-functional days is based on the number of days the cook stoves were under repair/replacement			
Frequency of monitoring/recording	Days of operation of improved cookstoves under operation is monitored annually based on sample survey			
Value monitored	Period	Total number of beneficiaries	Number of beneficiaries for which defunct date was a day/more	Average days of operation
	06 Oct 12 – 05 Oct 13	14,400	0	365
	06 Oct 13 – 05 Oct 14	14,400	0	365
	06 Oct 14 – 05 Oct 15	14,400	0	365
	06 Oct 15 – 05 Oct 16	14,400	0	365
	06 Oct 16 – 05 Oct 17	14,400	0	365
Monitoring equipment	-			

QA/QC procedures to be applied	The database for the date of dissemination of cook stoves, date of receipt of complaint for repair/ replacement and the date of repair/replacement is recorded by the village coordinator. The related information is maintained by the village co-ordinator and passed on to the VCS team on a monthly basis. In case of the cook stove being replaced, a new end user agreement is signed with the end user and attached to the original agreement. Monitoring database and the end user agreement is maintained both in soft as well as hard copy.
Purpose of the data	For estimation of baseline emission
Calculation method	-
Comments	The number of days for which the improved cook stoves were non-functional is considered for estimation of emission reduction. The record of database and copy of end user agreement is kept and maintained by the project participant for the period of two years after the last issuance. For ex-post, the total number of days of non-operation of the improved cook stoves due to repair, maintenance is retrieved from the maintenance log books is averaged as against the total number of cook stoves in actual operation (as per survey) and is considered. Say, if n is the total no of non- operational days as per the maintenance records of all of the cook stoves, the average days of non-operation for each cook stove is estimated as $= n/x$ where x is the number of cook stoves in actual operation as per the sample survey.

Data / Parameter	Number of days of functioning of traditional cook stoves
Data unit	Number
Description	The parameters refer to the number of days for which the traditional cook stove is being used by the household.
Source of data	Annual third-party agency survey of representative sample household
Description of measurement methods and procedures to be applied	Survey is carried out to estimate the number of days for which the household has operated the traditional cook stove during a particular monitoring period.
Frequency of monitoring/recording	Number of days of functioning of traditional cook stoves is monitored annually based on sample survey
Value monitored	0 During survey in case beneficiaries were evaluated to be using improved cook stoves for a limited period along with usage of traditional cookstoves the beneficiaries are considered as partial users. Partial users are beneficiaries /household, those who have not discontinued using of ICS but have been using

	ICS for a limited period and also using traditional cookstoves for the purpose of cooking along with ICS. Since the number of days of operation of partial ICS usage during a particular crediting period is hard to ascertain (uncertainty of estimation), therefore as a conservative approach the beneficiaries /household using ICS partially are considered as discontinued users. Since the beneficiary using traditional cookstoves were opted out of emission reduction estimation therefore the beneficiaries considered resembles only to those who are using improved cookstoves. Therefore the days of usage of traditional cookstoves for beneficiaries considered is zero.
Monitoring equipment	-
QA/QC procedures to be applied	The survey is carried out by third party agency and is co-ordinated by the project proponent.
Purpose of the data	For estimation of baseline emission
Calculation method	-
Comments	Number of days of operation of the traditional cook stove is obtained from the result of sample survey. The number of days of traditional cook stove as per the survey is used to obtain the average days of usage of the traditional cook stoves for all the households who still use the improved cook stoves of this project activity. This average day is used to arrive at a factor - $= (365 - \text{Average number of days of traditional cook stove usage in all households} / 365)$

Data / Parameter	Number of Cook stove replaced			
Data unit	Number			
Description	The parameters refer to the number of cook stove that are replaced (due to end-of-life time or damage) by the new cook stove with efficiency greater than or equal to 29.88%.			
Source of data	Monitoring database, new end user agreement and test certificate of the new system supplied.			
Description of measurement methods and procedures to be applied	Record is being updated in the databases as and when the improved cookstoves are replaced by a new one . On replacement a new end user agreement is signed with the existing end user and the information relating to the replacement along with necessary details is updated in the database.			
Frequency of monitoring/recording	Recorded as and when replaced			
Value monitored	Period	Number of improved cookstoves	Number of cookstoves replaced post end of life time	Number of cookstoves replaced

		distributed and under operation		due to defunct
	06 Oct 12 – 05 Oct 13	14,400	0	0
	06 Oct 13 – 05 Oct 14	14,400	0	0
	06 Oct 14 – 05 Oct 15	14,400	0	0
	06 Oct 15 – 05 Oct 16	14,400	0	0
	06 Oct 16 – 05 Oct 17	14,400	0	0
Monitoring equipment	-			
QA/QC procedures to be applied	The copy of the new end user agreement for the replaced cook stove along with the efficiency certificate of the new system is archived along with the existing agreement. The database is updated as and when the system is replaced.			
Purpose of the data	Assessment of baseline emission			
Calculation method	-			
Comments	The record of database and copy of end user agreements (both new and old one) is maintained by the project participant for the period of two years after the last issuance.			

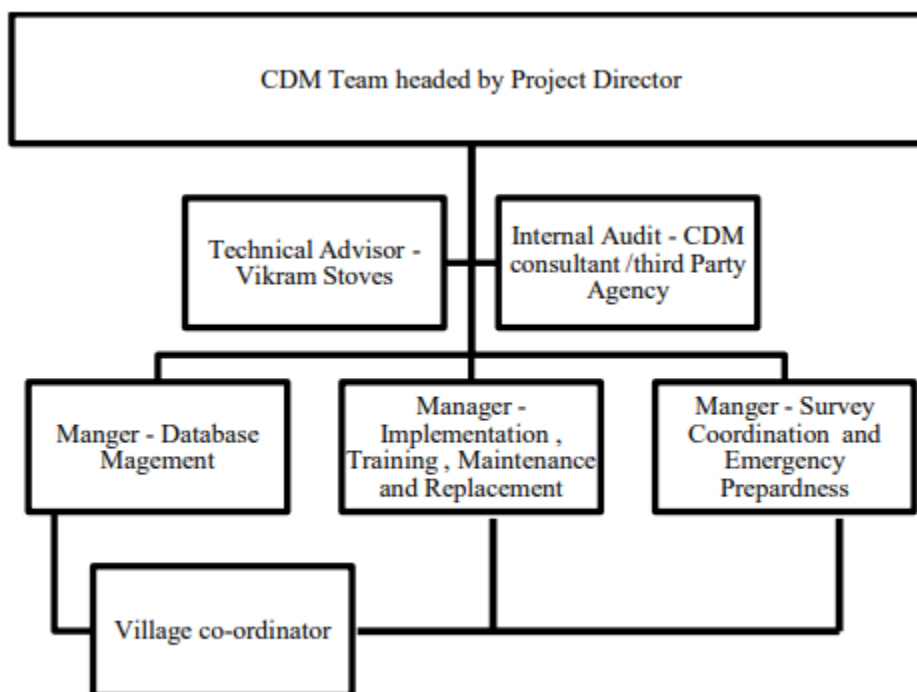
Data / Parameter	B_y, savings		
Data unit	Tonnes/year/household		
Description	Quantity of woody biomass that is saved through the project activity.		
Source of data	calculated		
Description of measurement methods and procedures to be applied	The quantity of woody biomass saved is calculated following the equation $B_{y, \text{saving}} = B_{\text{old}} * (1 - \eta_{\text{old}}/\eta_{\text{new}})$ Where, B_{old} is calculated based on number of days cook stove is operational as calculated above and per capita biomass consumption of 25.51 kg/person/month multiplied by 4.8 members per rural household also factoring into the number of days for which the traditional cook stoves were in operation and the number of days of non-functioning of the improved cook stoves. The efficiency of the project system is tested on a representative sample basis.		
Frequency of monitoring/recording	Calculated on an annual basis		
Value monitored	Period	Operational Efficiency considered	Estimated By savings/ ICS
	06 Oct 12 – 05 Oct 13	29.04%	0.9632
	06 Oct 13 – 05 Oct 14	28.70%	0.9571
	06 Oct 14 – 05 Oct 15	28.41%	0.9519
	06 Oct 15 – 05 Oct 16	27.90%	0.9426

	06 Oct 16 – 05 Oct 17	25.99%	0.9037
Monitoring equipment	-		
QA/QC procedures to be applied	The minimum tested efficiency of the representative samples or 29.88% is used for η_{new} .		
Purpose of the data	-		
Calculation method	-		
Comments	The data estimated and the survey related documents is archived by the project participant for the period of 2 years after the last issuance.		

4.3 Monitoring Plan

The monitoring of the Project activity is executed by the team of the Project Participant, Village level coordinator appointed by the Project Participant, Technical Advisor from Vikram Stoves and consultant whose specific role and responsibilities are explained as follows. The following section also explicitly indicates the monitoring plan, implementation and record archiving procedure, management of monitoring, facilitating survey, training, maintenance plan and emergency preparedness.

The detailed team structure for executing the monitoring is as follows:



Roles and Responsibilities

The roles and responsibilities of the team include:

- Undertaking awareness amongst the beneficiaries relating to usefulness of the cook stoves.
- Providing training to each entity on the operating methods and regular maintenance practice of improved cook stoves.
- Undertaking maintenance of the cook stoves on a periodic basis.
- Replacing supplied improved cook stoves with new one at the end of technical life time of the distributed system within the crediting period.
- Development and monitoring of project.
- Undertaking spot check, annual survey to access the usage, functional efficiency, maintain database and facilitate monitoring as described in section B.7.as well as the following section of the PDD.

The end users or beneficiaries is responsible for -

- Continual usage of cook stoves
- Undertaking regular maintenance
- Supporting the village coordinator and the project participant in undertaking monitoring
- Inform the village coordinator in case the cook stove malfunctions.
- Dismantle or refrain from use of traditional cook stove
- In case the family decides to shift to the same is intimated to the village coordinator.

The purpose of monitoring is to achieve actual and credible emission reduction estimation pertaining to the project activity. The project participant therefore, needs to monitor and archive data required for estimation of emission reduction.

According to the approved methodology AMS -II. G.; the monitoring comprises of –

1. Efficiency check of the representative sample on annual basis to ensure that, the cook stoves are still operating at the specified efficiency (η_{new}). If appliances are found to be operational with efficiency lower than 29.88%, the efficiency determined during monitoring is used to calculate emission reduction. (In accordance to Paragraph 15 of the approved methodology)
 - Thermal efficiency test is carried out in accordance to the Water Boiling Test Protocol as specified in IS 13152 (Part 1): 1991 standard.
 - The sample size is selected in accordance to "Guidelines for Sampling and Surveys for Project Activities and Programme of Activities" Version 2, EB 69.
2. Monitoring also consists of checking of representative sample on annual basis to determine if the improved cook stoves are still operating or are replaced by an equivalent in service appliance. In case of replacement, it is ensured that, efficiency of new equipment is similar to the equipment being replaced.

If the cook stove is replaced with higher efficiency appliances, then, the efficiency of 29.88% is considered as conservative approach. (In accordance to Paragraph 16 of the methodology)
3. Monitoring ensures that:

- a. Either the replaced low efficiency appliances are disposed of and not used within the boundary or within the region; or
- b. If baseline stoves continue to be used, monitoring ensures that the fuel-wood consumption of those stoves is excluded from Bold.

Therefore, the project proponent has developed a plan for monitoring under the following heads –

Implementation Arrangements and Record archiving-

All the household post to the distribution of the cook stoves is oriented to its usage and regular maintenance. With registration of the project under the UNFCCC; the project participant imparts an awareness session over cookstove usage.

As a part of the implementation program the project participant ensures:

1. Signing of the end user agreement with the beneficiaries (the project participant completes signing of end user agreement with all the beneficiaries who are being provided with the cook stoves before registration of the project). As a part of the contractual agreement with each of the beneficiaries for the titled project a unique identification number is issued as against to each project cook stoves. Moreover, as a part of the agreement each of the end user ascertains that they won't be entering into agreement with other agencies to obtain revenue. The above two steps nullify the chances of double counting.
2. The coordinators are employed under the project activity and is responsible for monitoring, archiving of the records and undertaking maintenance.
3. Creating database to archive relevant information about the end user, cook stoves and related information of the end user agreement. The database is created based on the end user agreement and is managed by the team. The database contains all the relevant information about the beneficiary in regard to the end user agreement. Each of the beneficiaries in the database is identified by the unique identification number. The database manager ensures that there has been no double counting/ repetition of the beneficiary information, location and unique identification number of the cook stoves. The database is updated on a regular basis to include:
 - a. Replacement of the cook stoves after schedule life time
 - b. Scheduled maintenance
 - c. Unscheduled maintenance or fault rectification measures undertaken
 - d. Temporary or permanent drop out

Finalizing the number of cook stoves for emission reduction estimation

As described in the section above in regard to the implementation arrangement and record archiving the dissemination of the cook stove to the household and its usage thereafter includes the following steps:

1. Signing of end user agreement
2. Dissemination of improved cookstoves

In accordance to the guidance of the methodology, emission reduction as against each cook stoves can only be estimated from the point of cook stove usage. Therefore, the date of dissemination of cook stoves and signing of the end user agreement with each beneficiary after dissemination is considered as the date from where the emission reduction calculation is initiated for each cook stove for the first monitoring period. For the purpose of estimation, the end date of cookstoves dissemination is considered as start date of the monitoring period.

Management of monitoring activities

The monitoring of the project activity is reviewed and coordinated by the top management of the Project Participant (GKEMPL) through Monitoring Coordinator, team of Project Participant (GKEMPL) headed by Project Director and technical team from Vikram Stoves. The persons and staffs involved in monitoring is trained over the procedure in accordance to the manual and works out under the supervision of the Project Director. The major task to be undertaken and the responsibility are as follows:

1. Co-ordinator: Each coordinator acts as coordinating point between the project household and the Team (respective manger). The village coordinator is responsible to facilitate and oversee continual operation of cook stoves, maintain database related to number of cook stoves distributed and replaced thereafter, filing complain relating to non-functioning and undertaking on-call maintenance, recording of the complaint and maintenance time line and periodic submission of information to the team.
2. Team: Creating and maintaining database and end user agreement, up-gradation of beneficiary level information in the central database. The team monitors related information pertaining to the replacement of the cook stoves¹⁴. In case household considered under the project activity fails to meet the condition of the end user agreement or household drops out (because of the shift to location outside project boundary for employment purpose/migration for a temporary period or even the beneficiary decided to discontinue usage of improved cook stoves) then, such dropout household is conservatively deducted on temporary or permanent basis from the emission reduction calculation for the particular monitoring period. The VCS team is responsible for estimating the emission reduction.
3. Maintenance team – Vikram Stoves is responsible for imparting training relating to the cook stove scheduled maintenance and undertaking periodic maintenance and on-call maintenance.
4. Daily usage- Household uses cook stove and intimate from time to time relating to non- functioning or temporary transfer/migration. The coordinator on basis of the usage report intimates the team.
5. Replacement of Existing improved cook stoves: In case the old cook stove is replaced by a new cook stove the same is to be done with similar or higher efficiency of existing cook stove (29.88%). On replacement a new end user agreement is

¹⁴ The replaced cook stoves is to dismantled and sold out to the cast iron and steel units respectively in order to recycle the system components. Such initiatives nullifies the chances of the replaced cook stove to be re-used.

signed with the existing end user the same information relating to the replacement along with necessary details is updated in the database. The copy of the new end user agreement for the replaced cook stove along with the efficiency certificate of the new system is archived along with the existing agreement. The database is updated as and when the system is replaced. The replaced cook stoves is dismantled and sold out to the cast iron and steel units respectively in order to recycle the system components. Such initiatives nullify the chances of the replaced cook stove to be re-used.

Monitoring of Traditional cook stove usage

The traditional cook stove is considered as an auspicious with religious value and household consider it as a linkage to their tradition so, the household has kept the stove. However, each household has assured and confirmed through signing of end user agreement with the project participant to continue using of improved cook stoves at household.

However, as a conservative approach to monitor fuel wood consumption in the project household from use of existing mud cook stove, third party survey is carried out of representative sample household on annual basis to evaluate the number of days for which the traditional stoves has been operated across the year. The number of days for which the traditional stoves were in operation is used to derive the factor to be adjusted with B_{old} . The factor is calculated as follows:

$$= (365 - \text{Average No. of days of traditional cook stoves usage in all households}) / 365$$

The factor calculated using above approach is multiplied with B_{old} to calculate the value of B_{old} to be used for ex-post calculation of emission reduction.

Sampling design

Objective: The objective of the sample design is to determine –

- Efficiency of Improved cook stove in operation:** Efficiency of the system is tested by third party agency of a representative sample on principle of the Water Boiling Test Protocol indicated in IS 13152 (Part 1): 1991.
- Usage Survey** – This is conducted on annual basis to determine the number of cook stove in operation. The survey is initiated after a year from date of project registration.
- Usage of traditional cook stoves:** The survey is conducted to determine the number of days for which the household is using the traditional cook stoves.

Reliability Requirement: As per paragraph 22 of the approved methodology AMS - II.G; 90% confidence interval and 10% margin of error needs is considered conceiving the fact that survey is carried out on an annual basis.

Target Population: The number of cook stove conceived under the project activity is 14,400.

Survey Method: Simple Random sampling is chosen, as the population under the project activity are homogeneous owing to the selection of beneficiary from similar socio-economic circumstances.

Sample Size:

The sample size is calculated using exact equation for random sampling –

$$n \geq 1.645^2 N * p * (1-p) / ((N-1) * 0.1^2 * p^2 + 1.645^2 * p * (1-p))$$

Where,

N	=	Sample size
N	=	14,400
P	=	expected proportion (on basis of assumption that, 90% of the cook stove is in operation and at the desired efficiency)
1.645	=	Represents 90% confidence required
0.1	=	Represent 10% relative precision

a) Sample size for Efficiency test

Although the cook stoves are designed to operate at a desired efficiency level throughout its life time subjected to periodic maintenance; efficiency test of the cook stoves is carried out on annual basis. The sample size for undertaking efficiency test is therefore, decided considering 90% of the cook stoves operates at a specified efficiency of 29.88%.

Following equation (3) above, the number of sample size arrived as below –

Time Period	Percentage of cook stove operational at specified efficiency at any point of time during the entire crediting period (This assumption is only for estimation of sample size) ⁶²	Sample size for survey (No. of systems)	Sample size after conceiving response rate of 80%
Annual	90%	31	40

(Note: the final sample size is rounded up and increased to the next closest integer)

The household for testing the efficiency as stated above is selected on a random sample basis. However while undertaking the sample beneficiary selection it is ensured that the household opted for efficiency testing are not common with the household /beneficiary selected for sample survey for improved cook stove usage and traditional cook stove usage during a particular year. Moreover, it is ensured that the household once selected for efficiency testing during a particular year is opted out from the selection procedure in course of the crediting period for further testing.

Data to be collected -

Field Measurement – Frequency: The efficiency testing of sample system is carried out on an annual basis. The inspection is carried out one year after the date of registration. There after once in every year the survey is conducted.

QA/QC Procedure: Each system is assigned with unique identification details. The systems to be sampled is randomly selected using software or random number tables and screen shots of the same is kept in the data base. The PP gets the services of third party agency or any scope accredited DOE including the verifier for conducting the efficiency test of the samples presented by the PP before the preparation of the monitoring report.

Analysis: In case of the efficiency tested for the sample system is found to be lower than 29.88% then, the minimum value of efficiency tested is considered as a threshold for the subsequent years in place of 29.88% till the point further lower value of efficiency is tested.

b) Sample size determination for no. of improved cook stoves in operation and no of days of traditional cook stove usage

The sample size is estimated for determining the number of cook stoves in operation on basis of assumption that, 90% (This assumption is only for estimation of sample size) of cook stove is operational i.e. proportion of the cook stove in operation during a particular year is 0.9.

Therefore, $n \geq 31$

For covering 100 percent of the sample and expecting a response rate of 80%. Thus, the sample size is estimated as $31/80\% = 39$. However, to cover the wide range of population and have a conservative sample the PP selects 4 times the number of sample estimated i.e., 156 numbers of household every year for the sample.

The household survey is designed to estimate the percentage of cook stove still in operation and number of days for which the traditional cook stoves are used for the purpose of estimation of emission reduction. The survey questionnaire essentially contain the unique identification details of the household, satisfactory level of usage and service, date of signing of the agreement, information regard to the maintenance or replacement if any, number of person in the household, other type of stoves used if any (type of fuel) and number of days of traditional cook stove usage (specific details about the festive season and any other occasion the traditional cook stove is used, if the size of the members are extremely high when it is not possible to use the improved cook stove).

It is to be noted that the household selected for the usage survey for determination of proportion of cook stove in operation is common where the survey for determining the number days for which the traditional cook stoves usage is carried out. The samples once surveyed in a year is not considered for subsequent year.

Data to be collected

Field Measurement – Frequency: The survey is carried out on an annual basis from the date of registration in specified format duly signed by the beneficiary to assess whether the beneficiary has been using the cook stoves distributed till date and to assess the number of days for which the beneficiary has used the traditional cook stoves during that year.

QA/QC Procedure: Each system is assigned with unique identification details. The systems to be sampled is randomly selected using software or random number tables and screen shots of the same is kept in the data base. The PP gets the services of third party agency or any scope accredited DoE including the verifier for taking the survey before the preparation of the monitoring report.

Analysis: Based on the response the percentage of improved cook stoves which are distributed as the part of this project activity that are still operated by the households and the average number of days of operation of the traditional cook stoves by each household would be estimated and the same is considered for ex-post emission reduction calculation.

The sample beneficiaries/household is same where the survey is carried out for estimation of operation of improved cook stoves and traditional cook stoves i.e. a single survey is designed to capture both. Moreover, it is ensured that the household once selected for survey during a particular year is opted out from the selection in course of the subsequent crediting period for further testing.

Sl. No.	Description	Data to be collected	Method of survey	Sampling method	Proposed Sample size	Variance
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1	Efficiency of Improved cook stove	Testing of the Efficiency of the improved cook stoves	Household Collection and conducting the test for the selected samples.	Simple Random sampling	40	90% Confidence level
2	Usage survey	No of system in operation	Household survey	Simple Random Sampling	160 household/ annum	90% confidence level
	Traditional cook stove usage	No of days for which the household use traditional cook stoves are used in the project household	Household survey	Simple Random Sampling	160 household/ annum	90% confidence level

Reliability Check

The sample size as indicated in the table above is subjected to the final value of the precision calculated and in case the value of the precision estimated from the survey result is less than $\pm 10\%$ then, the sample size is re-estimated and the additional number of beneficiary/households is interviewed to obtain the desired level of precision. The precision is calculated as follows:

Step1: Estimation of the value of proportion (p)

P = number of success/ number of cook stoves that were observed in the sample

Step 2: Estimating Standard Error of the proportion

The standard error of the proportion is estimated using the following equation Standard error of proportion = $\sqrt{(1-f) pq/n}$

Where,

f = sampling fraction = number of cook stoves that are observed in the sample/14,400, i.e., 160/14,400. p = proportion, 90%

q = (1-p)

n = number of cook stoves that are observed in the sample

Step 3: Estimating of Precision

Proportion= $\pm z$ value * standard error of proportion

z value = for 90% confidence level the value of z is 1.645 Standard error of proportion = estimated in step 2

Step 4: Estimating of Relating Precision Relative Precision = Precision/proportion Where,

Proportion is estimated in step 1 and precision in step 3

In case the value of the relative precision estimated based on the level of success relating to

1. Tested Efficiency of the improved cook stove being equal to greater than 29.88%
2. Number of the beneficiaries using improved cook stove
3. Number of beneficiaries/households using traditional cook stoves is not within the specified limit of $\pm 10\%$ the value of sample size is increased and survey is carried out amongst the additional population to obtain the desired level of precision i.e. within $\pm 10\%$.

Training

The training is imparted to the following entities in following way-

Entity	Objective of training	Trained by	Onset	Frequency
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Household	Operational procedure Scheduled maintenance Itemised recording and reporting	Vikram Stoves (for item no 1. and 2) team (for item 3)	After distribution	Once
Village Coordinator	Monitoring of the related parameter like Spot check of cook stove usage, situational review Database management and coordination with team System Maintenance	VCS team (for item no. 1 and 2) Vikram Stoves (for item 3)	On appointment	Once in a year
VCS team	Database management Undertaking Monitoring, Recording and archiving Preparation of monitoring report	Consultant and Top Management of the Project participant	On registration	Once in a year

Quality Assurance and Quality Control of monitoring activities–

Top management of the Project participant (GKEMPL) is responsible for QA/QC which includes monitoring of accurate and transparent record keeping, monitoring and evaluation so that all supporting documentation and records for the project is easily accessible for spot checking and cross referencing by a third-party agency. Top management of the project participant ensures quality control of the monitoring activities in order to guarantee of records and to confirm absence of double-counting in any form. Project participant ensures that, the detailed beneficiary level database and the project database is up to date and the latter is representative of the most recent definitions of clusters. Internal audit is carried out on six month basis by the consultant or third party agency and includes -

1. The internal review is carried out in every six month for compliance check in accordance to the manual.
2. Non conformity if noted is reported and brought into the notice of the top management and measures is undertaken to ensure that required compliance is met.
3. Training on the monitoring if felt by the auditor is imparted to the team.

Emergency Preparedness

In case the village coordinator is reported against malfunction/ non-function of cook stove which the technical team is unable to rectify the fault and unable to co-ordinate with the technical team of Vikram Stoves; the coordinator immediately replace the existing cook stove with the new one. The faulty stoves thereafter be transported to the industry for repair.

1. The coordinator is provided with stand-by stove components for repair and/or replacement.
2. Few numbers of cook stoves are stocked with the Panchayat Samity/ Block Development Office to reduce the down time of replacement.
3. In case the coordinator is unable to carry out maintenance, the same is reported to the technical team of Vikram Stoves and the nearby representatives visits the village to support the co- Ordinator in rectifying the fault.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline Emissions is estimated in following way –

$$ER_y = B_{y, savings} * f_{NRB,y} * NCV_{biomass} * EF_{projected fossil fuel}$$

Where, in accordance to paragraph 13 of the methodology, leakage related to the non-renewable woody biomass saved by the project activity is assessed based on ex post surveys of users and the areas from which this woody biomass is sourced. Subsequent to the clarification provided in sub paragraph (a) survey is not required for ex-post estimation of leakage in case B_{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages.

Parameter	Data	Unit
B_{old}	1.469	Tonne fuel wood /cook stove/ year
$B_{y, savings}$	0.9774	Tonne fuel wood /cook stove/ year
$f_{NRB,y}$	87.90%	
$NCV_{biomass}$	0.015	TJ/tonne
$EF_{projected fossil fuel}$	81.60	tCO ₂ e/TJ
$ER_{y,WGA,per cook stove}$ (Emission reduction/ cook stove /year without gross adjustment factor for B_{old} to account for leakage)	1.0515	tCO ₂ e /cook stove/ year

The leakage emission for ex-ante estimation of emission reduction is thereby calculated as a difference between the emission reduction estimated considering the actual value of Bold i.e. 1.469 Tonne fuel wood /cook stove/ year and emission reduction estimated by considering the value of Bold is estimated by multiplying Bold with a net to gross adjustment factor of 0.95.

For the purpose of ex-ante estimation of emission reduction, it is assumed that, only 90% of the cook stoves are operational in any point of time. Thus, the emission reduction per year ($ER_{y, WGA}$) without gross adjustment factor for B_{old} to account for leakage considering 90% of the cook stove as operational for the entire crediting period is 13,627 tCO₂e /year.

The Baseline Emissions achieved for this monitoring period is 64,401 tCO₂e /year.

The year wise efficiency of the improved cookstoves tested and considered for estimation of baseline emission is outlined in the table below

Third party assessment for monitoring period – Year 1			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-1300	Vilas Punjaji Banakar	Parbhani	29.040%
GKEMPLPH-18-6440	Tukaram Eknath Lad	Washim	29.110%
GKEMPLPH-18-9027	Uddhav Damodhar Gaikwad	Nagpur	29.125%
GKEMPLPH-18-5305	Diliprao Haribhau Banayat	Latur	29.143%
GKEMPLPH-18-3796	Chandrbhagabai Prakash Wagh	Nanded	29.161%
GKEMPLPH-18-7719	Sandip Bhagwan Mule	Wardha	29.172%
GKEMPLPH-18-6118	Baliram Dadarao Khotkar	Akola	29.238%

Third party assessment for monitoring period – Year 1			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-8778	Shankar Jagannath Dhumal	Nagpur	29.246%
GKEMPLPH-18-7476	Santishi Dattaray Harne	Yavatmal	29.264%
GKEMPLPH-18-11169	Vandana Vinayak Rathod	Chandrapur	29.292%
GKEMPLPH-18-7357	Shinde Bhagwan Vinayakrao	Yavatmal	29.293%
GKEMPLPH-18-8092	Gautam Narhari Lahane	Wardha	29.296%
GKEMPLPH-18-5945	Santosh Babasaheb Jige	Buldhana	29.335%
GKEMPLPH-18-5745	Rameshwar Babasaheb Ubale	Buldhana	29.402%
GKEMPLPH-18-12358	Sakhubai Santram Pawar	Gadchiroli	29.435%
GKEMPLPH-18-4396	Sarswati Shankar Rokade	Osmanabad	29.453%
GKEMPLPH-18-12606	Janardhan Mamtaji Palve	Gadchiroli	29.477%
GKEMPLPH-18-112	Nanasaheb Limbaji Pawar	Aurangabad	29.479%
GKEMPLPH-18-3328	Jyoti Rajendra Kharad	Beed	29.488%
GKEMPLPH-18-10500	Wajid Ibrahim Shaikh	Bhandara	29.516%
GKEMPLPH-18-6653	Bapurao Jagannath Kurdhane	Washim	29.519%
GKEMPLPH-18-10136	Bhagvan Kundlikrav Tupe	Bhandara	29.533%
GKEMPLPH-18-13626	Ganesh Vasantrav Ubale	Gondia	29.569%
GKEMPLPH-18-976	Vinod Uttam Bhople	Parbhani	29.575%
GKEMPLPH-18-9863	Padamabai Sureshrao Katore	Bhandara	29.579%
GKEMPLPH-18-4171	Balu Karbhari Yevle	Nanded	29.585%
GKEMPLPH-18-5277	Lahu Chagan Jadhav	Latur	29.602%
GKEMPLPH-18-7341	Yashodabai Ambarsing Chavan	Amravati	29.618%
GKEMPLPH-18-6183	Sakunde Dinkar Rambhau	Akola	29.621%
GKEMPLPH-18-9675	Shivaji Laxmanrao Shingate	Bhandara	29.627%
GKEMPLPH-18-13097	Gangadhar Ramabhau Gadhave	Gadchiroli	29.635%
GKEMPLPH-18-13644	Kisanrao Yadavrao Mohite	Gondia	29.645%
GKEMPLPH-18-1808	Anand Sheshrao Mhaske	Hingoli	29.674%
GKEMPLPH-18-278	Panjab Daulat Manekar	Aurangabad	29.678%
GKEMPLPH-18-7110	Radha Krushna Ghate	Amravati	29.733%
GKEMPLPH-18-3025	Vitthal Laxman Ugale	Beed	29.756%
GKEMPLPH-18-14167	Maroti Rambhau Amate	Gondia	29.760%
GKEMPLPH-18-619	Dnyanoba Bhimarav Nagargoje	Jalna	29.782%
GKEMPLPH-18-11648	Govind Parmeshwar Taur	Chandrapur	29.838%
GKEMPLPH-18-1877	Mahadeo Nivrutti Maske	Hingoli	30.010%

Third party assessment for monitoring period – Year 2			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-4913	Shivaji Pandurang Tupe	Latur	28.695%
GKEMPLPH-18-8167	Raghunath Kashinath Golde	Wardha	28.716%
GKEMPLPH-18-5942	Tulasabai Suryabhan Khadekar	Buldhana	28.722%
GKEMPLPH-18-137	Sunanda Gambhir Falke	Aurangabad	28.730%
GKEMPLPH-18-10542	Ravindra Sanpatrao Deshamukh	Bhandara	28.733%
GKEMPLPH-18-8190	Bhagawat Babu Kavathekar	Wardha	28.753%
GKEMPLPH-18-4427	Punjaram Dagduba Kshirsagar	Osmanabad	28.758%
GKEMPLPH-18-2019	Alaka Bhagwan Wagh	Hingoli	28.763%
GKEMPLPH-18-11687	Namdev Dagdu Chalke	Chandrapur	28.806%
GKEMPLPH-18-934	Avinash Haridas Kadw	Parbhani	28.822%
GKEMPLPH-18-4106	Arjun Thau Jadhav	Nanded	28.839%

Third party assessment for monitoring period – Year 2			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-8580	Shankar Pralhadrao Jadhav	Nagpur	28.870%
GKEMPLPH-18-10259	Pandurang Ananta Mule	Bhandara	28.881%
GKEMPLPH-18-5953	Sainth Maroti Shinde	Buldhana	28.907%
GKEMPLPH-18-14113	Bhagwat Ankush Phoke	Gondia	28.930%
GKEMPLPH-18-7195	Narayan Shrirang Sagade	Amravati	28.973%
GKEMPLPH-18-8318	Dipabai Anil Helwade	Nagpur	29.003%
GKEMPLPH-18-9767	Priti Shrinivas Thete	Bhandara	29.007%
GKEMPLPH-18-13560	Babarao Mhasaji Kharat	Gondia	29.015%
GKEMPLPH-18-5432	Gayabai Laxman Kalkate	Latur	29.036%
GKEMPLPH-18-7462	Janak Ankushrao Markad	Yavatmal	29.067%
GKEMPLPH-18-1336	Babulal Bhikan Bramhane	Parbhani	29.128%
GKEMPLPH-18-7393	Nita Dnyaneshwar Yadav	Yavatmal	29.139%
GKEMPLPH-18-13804	Rayabhan Sundarrao Khadekar	Gondia	29.159%
GKEMPLPH-18-4221	Dadarao Bhaurao Kund	Nanded	29.166%
GKEMPLPH-18-12504	Nilabai Ambadas Kolhe	Gadchiroli	29.180%
GKEMPLPH-18-277	Yogesh Tukaram Shelke	Aurangabad	29.205%
GKEMPLPH-18-9882	Ranjana Kishor Pawar	Bhandara	29.205%
GKEMPLPH-18-12240	Uttamrav Ganpat Parakhe	Gadchiroli	29.207%
GKEMPLPH-18-12287	Annasaheb Vitthalrao Ubale	Gadchiroli	29.209%
GKEMPLPH-18-6163	Shadev Pandurang Garje	Akola	29.220%
GKEMPLPH-18-10855	Dnyaneshwar Kaduba Ugale	Chandrapur	29.239%
GKEMPLPH-18-6657	Kamlabai Baburao Jadhav	Washim	29.317%
GKEMPLPH-18-2563	Ashabai Ashruba Zinhurde	Beed	29.379%
GKEMPLPH-18-646	Narayan Kisan Jadhav	Jalna	29.393%
GKEMPLPH-18-2296	Ramprasad Mahadev Gade	Hingoli	29.545%
GKEMPLPH-18-6155	Archana Dnyaneshwar Pawar	Akola	29.571%
GKEMPLPH-18-2558	Ashabai Bhaskar Sasane	Beed	29.583%
GKEMPLPH-18-7105	Baburao Bhagwan Jadhav	Amravati	29.591%
GKEMPLPH-18-6722	Najirkhan Amirkhan Pathan	Washim	29.615%

Third party assessment for monitoring period – Year 3			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-11622	Dinesh Bhagavan Godse	Chandrapur	28.408%
GKEMPLPH-18-2030	Alkabai Vishvanath Wagh	Hingoli	28.424%
GKEMPLPH-18-7578	Ashvini Sharad Solunke	Yavatmal	28.440%
GKEMPLPH-18-7278	Rushindar Pandurang Kharat	Amravati	28.446%
GKEMPLPH-18-1923	Kalyanrao Raosaheb Kale	Hingoli	28.464%
GKEMPLPH-18-7643	Shivkaknya Ashok Salunke	Yavatmal	28.496%
GKEMPLPH-18-11885	Ramchandra Abaji Mohite	Gadchiroli	28.496%
GKEMPLPH-18-3976	Ashok Laxman Satpute	Nanded	28.503%
GKEMPLPH-18-6064	Kundalik Vinayak Rathod	Akola	28.522%
GKEMPLPH-18-9869	Gangadhar Murlidhar Ghongade	Bhandara	28.550%
GKEMPLPH-18-37	Banabai Gopala Lokhande	Aurangabad	28.570%
GKEMPLPH-18-12257	Satyakumar Laxminarayan Bangad	Gadchiroli	28.600%
GKEMPLPH-18-10040	Manikrao Deorao Mothe	Bhandara	28.628%
GKEMPLPH-18-2797	Anjana Dnyaydev Vidhate	Beed	28.631%
GKEMPLPH-18-6867	Pandurang Sakham Takale	Washim	28.633%
GKEMPLPH-18-4199	Samadhan Hanesrao Pimple	Nanded	28.666%
GKEMPLPH-18-1481	Shivaji Rajaram Sonavne	Parbhani	28.680%

Third party assessment for monitoring period – Year 3			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-8837	Bhimrao Shrimant Lahane	Nagpur	28.682%
GKEMPLPH-18-13643	Bharat Sheshrao Sapkal	Gondia	28.688%
GKEMPLPH-18-10247	Alka Sanjay Kayande	Bhandara	28.716%
GKEMPLPH-18-25	Vimal Annasaheb Lokhande	Aurangabad	28.721%
GKEMPLPH-18-7249	Vikram Narayan Rokade	Amravati	28.735%
GKEMPLPH-18-8357	Chatrabhuj Radhakisan Ugale	Nagpur	28.741%
GKEMPLPH-18-631	Kailas Jaganath Misal	Jalna	28.753%
GKEMPLPH-18-8132	Santosh Rajendra Ubale	Wardha	28.762%
GKEMPLPH-18-5687	Gulabrao Appaji Naik	Buldhana	28.768%
GKEMPLPH-18-13367	Narayan Eknath Solunke	Gondia	28.823%
GKEMPLPH-18-12664	Sheshrao Bhanudas Lahamge	Gadchiroli	28.829%
GKEMPLPH-18-5058	Vinod Anandrao Mohod	Latur	28.834%
GKEMPLPH-18-7942	Datta Ankush Khoje	Wardha	28.845%
GKEMPLPH-18-6783	Devidas Pandharinath Wagh	Washim	28.867%
GKEMPLPH-18-6001	Vishwanath Narayan Taur	Akola	28.876%
GKEMPLPH-18-10642	Santosh Digambar Hanwate	Bhandara	28.891%
GKEMPLPH-18-5519	Zafar Majid Sayyad	Latur	28.902%
GKEMPLPH-18-11582	Renuka Santosh Ubale	Chandrapur	28.912%
GKEMPLPH-18-2666	Babasaheb Trimbak Ghembad	Beed	28.968%
GKEMPLPH-18-1089	Asaram Devrao Khavate	Parbhani	28.975%
GKEMPLPH-18-13422	Gamaji Namdev Gayke	Gondia	28.987%
GKEMPLPH-18-5704	Sanjay Prabhakar Kothode	Buldhana	29.025%

Third party assessment for monitoring period – Year 4			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-6152	Kashinath Sahebrao Dhere	Akola	27.904%
GKEMPLPH-18-13524	Pralhad Ramkisan Ghule	Gondia	27.947%
GKEMPLPH-18-8281	Ashabai Ganpat Dhamurade	Wardha	27.958%
GKEMPLPH-18-2226	Rameshwar Tukaram Shinde	Hingoli	27.960%
GKEMPLPH-18-9109	Vasant Chagan Rathod	Nagpur	27.969%
GKEMPLPH-18-9522	Nita Krushna Gavali	Bhandara	27.990%
GKEMPLPH-18-7417	Kacharu Kisanrao Shinde	Yavatmal	27.993%
GKEMPLPH-18-13853	Namdev Maroti Gayake	Gondia	28.002%
GKEMPLPH-18-730	Godavari Pundlikrao Bardhe	Jalna	28.019%
GKEMPLPH-18-1375	Ramesh Rajaram Pote	Parbhani	28.026%
GKEMPLPH-18-13172	Udhav Kishanrao Surya	Gadchiroli	28.033%
GKEMPLPH-18-4071	Meera Ganesh Jadhav	Nanded	28.054%
GKEMPLPH-18-219	Raju Fulasing Chindhote	Aurangabad	28.060%
GKEMPLPH-18-5768	Arun Baburao Bangar	Buldhana	28.063%
GKEMPLPH-18-14061	Raghunath Madhavrao Doifode	Gondia	28.082%
GKEMPLPH-18-6696	Haribhau Ankushrav Deshmukh	Washim	28.094%
GKEMPLPH-18-2243	Deorao Jayram Ukhare	Hingoli	28.097%
GKEMPLPH-18-3392	Gulab Lal Sayyad	Beed	28.098%
GKEMPLPH-18-5919	Rameshwar Gangaram Chandgude	Buldhana	28.124%
GKEMPLPH-18-6357	Padmabai Valmik Kavde	Washim	28.140%
GKEMPLPH-18-1413	Shridharrao Madhavrao Dhakne	Parbhani	28.168%
GKEMPLPH-18-7179	Aniket Uddhav Nandre	Amravati	28.190%
GKEMPLPH-18-7269	Bhagawan Bhaurao Chirkhe	Amravati	28.193%

Third party assessment for monitoring period – Year 4			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-5379	Mahadev Ankush Udhan	Latur	28.230%
GKEMPLPH-18-9826	Parmeshwar Kundlik Kambale	Bhandara	28.232%
GKEMPLPH-18-9742	Prabhudas Vishwanath Ghule	Bhandara	28.245%
GKEMPLPH-18-5070	Sambhaji Vishnu Hiwre	Latur	28.278%
GKEMPLPH-18-7514	Rameshear Lalachand Bajaj	Yavatmal	28.294%
GKEMPLPH-18-298	Shrikisan Sitaram Thosar	Aurangabad	28.302%
GKEMPLPH-18-11216	Ashruba Sopan Arbad	Chandrapur	28.304%
GKEMPLPH-18-8100	Sanjay Udhavrao Mohite	Wardha	28.352%
GKEMPLPH-18-3745	Bapusaheb Tejrao Sirsath	Nanded	28.405%
GKEMPLPH-18-2587	Shrihari Umaji Mote	Beed	28.419%
GKEMPLPH-18-11228	Khivraj Bhanudas Geete	Chandrapur	28.463%
GKEMPLPH-18-4575	Pandurang Sudamrao Lad	Osmanabad	28.508%
GKEMPLPH-18-9094	Savitabai Prakash Tidke	Nagpur	28.531%
GKEMPLPH-18-12252	Shivaji Tukaram Bhojane	Gadchiroli	28.576%
GKEMPLPH-18-10345	Vishnu Uttam Palve	Bhandara	28.577%
GKEMPLPH-18-12421	Bapurao Ramkisan Nagve	Gadchiroli	28.691%
GKEMPLPH-18-6133	Pandharinath Ambadas Kadam	Akola	28.693%

Third party assessment for monitoring period -Year 5			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-349	Ramakisan Tulshiram Sanap	Aurangabad	25.986%
GKEMPLPH-18-11627	Minabai Baliram Mule	Chandrapur	26.012%
GKEMPLPH-18-12177	Prbhakar Narayan Nagwe	Gadchiroli	26.030%
GKEMPLPH-18-10296	Anada Sakham Solunke	Bhandara	26.071%
GKEMPLPH-18-2274	Nagorav Gopinath Jagtap	Hingoli	26.118%
GKEMPLPH-18-14050	Sakham Ranganath Labhade	Gondia	26.148%
GKEMPLPH-18-9583	Vidya Ganesh Mashke	Bhandara	26.155%
GKEMPLPH-18-4224	Rameshwar Mahadevrao Parate	Nanded	26.168%
GKEMPLPH-18-7160	Dnyaneshwar Raghuna Pradhan	Amravati	26.219%
GKEMPLPH-18-12164	Shivaji Karbhari Talekar	Gadchiroli	26.224%
GKEMPLPH-18-5847	Vilas Dadarao Bhalerao	Buldhana	26.224%
GKEMPLPH-18-7625	Sumitrabai Jagannath Mule	Yavatmal	26.263%
GKEMPLPH-18-590	Sarswati Vitthal Mangde	Jalna	26.283%
GKEMPLPH-18-7579	Yogesh Vilasrao Deshmukh	Yavatmal	26.291%
GKEMPLPH-18-3820	Ramaro Patilba Kala	Nanded	26.355%
GKEMPLPH-18-6221	Nayyum Latif Shaikh	Akola	26.456%
GKEMPLPH-18-1657	Subhash Kisanrao Akhare	Parbhani	26.574%
GKEMPLPH-18-13704	Dhar Vinod Nalhari	Gondia	26.600%
GKEMPLPH-18-13501	Baburav Namdev Godhe	Gondia	26.636%
GKEMPLPH-18-2653	Pandharinath Ganpat Puri	Beed	26.641%
GKEMPLPH-18-6995	Antikabai Nayabrao Dhere	Washim	26.694%
GKEMPLPH-18-6154	Sorajabai Bhanudas Mhaske	Akola	26.729%
GKEMPLPH-18-12752	Narayan Aapasaheb Uphad	Gadchiroli	26.737%
GKEMPLPH-18-9519	Sumitra Nanasaheb Tarakh	Bhandara	26.748%
GKEMPLPH-18-7257	Yamunabai Limbaji Shingade	Amravati	26.812%
GKEMPLPH-18-1473	Rukhman Dagdu Sapate	Parbhani	26.841%
GKEMPLPH-18-11101	Sudhakar Sanpatraw Ekhande	Chandrapur	26.866%
GKEMPLPH-18-307	Satpal Babulal Kunthabare	Aurangabad	26.900%
GKEMPLPH-18-4930	Parameshwar Bajirao Kayande	Latur	26.974%

Third party assessment for monitoring period -Year 5			
Identification number	Beneficiary name	District	Tested Efficiency
GKEMPLPH-18-9951	Kadusram Sadashiv Kharat	Bhandara	27.006%
GKEMPLPH-18-8181	Arjun Baburav Khande	Wardha	27.126%
GKEMPLPH-18-6594	Sarjerao Khobraji Adagale	Washim	27.135%
GKEMPLPH-18-7699	Shobha Prakash Pawar	Wardha	27.184%
GKEMPLPH-18-8967	Asman Shankar Kavade	Nagpur	27.351%
GKEMPLPH-18-2318	Mungilal Pilu Bethekar	Hingoli	27.571%
GKEMPLPH-18-2926	Anita Ashok Barote	Beed	27.664%
GKEMPLPH-18-5772	Satish Eknath Kale	Buldhana	27.776%
GKEMPLPH-18-4408	Raju Banomal Zambani	Osmanabad	27.902%
GKEMPLPH-18-9089	Kundlik Bhanudas Sirsat	Nagpur	27.911%
GKEMPLPH-18-5531	Krushna Devrao Bhale	Latur	28.127%

5.2 Project Emissions

Project emissions are considered as zero for this project as no fossil fuels are used

5.3 Leakage

The leakage emission per cook stove is estimated as difference between the emission reduction estimated considering the actual value of Bold and emission reduction estimated considering the value of Bold obtained by multiplying Bold with a net to gross adjustment factor of 0.95.

Parameter	Data	Unit
Leakage emission	0.053	tCO ₂ e /cook stove/ year
Leakage emission due to use of traditional cook stove usage (assuming 0 for ex-ante)	0	tCO ₂ e /cook stove/ year
Leakage emission, (LEy, per cook stove)	0.053	tCO ₂ e /cook stove/ year

Therefore, the total leakage emission (LEy) for the project activity assuming 90% of 14,400 Nos. cook stove distributed is 682 tCO₂e /year.

The leakage emissions achieved for this monitoring period is 3,223 tCO₂e /year.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
06 Oct 12 – 05 Oct 13	11,379	0	569	10,810
06 Oct 13 – 05 Oct 14	13,900	0	696	13,204

06 Oct 14 - 05 Oct 15	13,641	0	683	12,958
06 Oct 15 - 05 Oct 16	13,232	0	662	12,570
06 Oct 16 - 05 Oct 17	12,249	0	613	11,636
Total	64,401	0	3,223	61,178

Comparison with the actual emission reductions achieved with the estimated emission reductions:

Duration	Net emission reduction for the project activity in the year y, ER_y	Estimated Emission Reductions	Comparison
17-12-2012 -16-12-2017	61,178	64,725	-5.80%