TRAMONTANA ICS-01 – THE DISTRIBUTION OF IMPROVED COOKSTOVES TO INDIGENOUS COMMUNITIES ACROSS RURAL INDIA

BY

TRAMONTANA

Document Prepared by

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Background

A recent Government of India report for 2019-21[1], concluded that 43.3% of the Indian population use solid fuels for cooking. The majority of these, or 33.4% of the total population which equates to approximately 450 million people, specifically use wood and are located in rural areas. Cookstoves form a central component of a family's life in rural communities, as it is typically used for cooking, room heating and boiling water for drinking and bathing. The traditional stove type used is predominantly a fixed mud clay stove (shown in Figure 1 and Figure 15) and in some cases a three-stone stove (shown in Figure 3). Another Government of India report[2] for 2019-21 estimates that of the Indian population using solid fuels, 95.4% use mud clay stoves. The traditional stoves used are mainly fuelled by unsustainably sourced firewood from local forests. The firewood then often needs to be carried over long distances by headload, as depicted in Figure 1.

Figure 1. Indigenous community member in the project area using a traditional mud clay cookstove and another carrying firewood by headload to her home

Health Implications

The World Health Organisation estimated that over 800,000 people[2] in India lost their lives prematurely in 2019 due to household air pollution. This is the largest number of any country. The primary cause is the use of poorly designed traditional inefficient biomass cookstoves in homes, which results in incomplete combustion and large quantities of toxic pollutants being emitted into the immediate environment, in the form of smoke, soot and other particulate matter (PM).

Environmental Implications

[1] http://rchiips.org/nfhs/NFHS-5Reports/NFHS-5_India_Report.pdf

[2] https://www.who.int/data/gho/data/indicators/indicator-details/GHO/household-air-pollution-attributable-deaths

The World Bank[3] estimates that traditional cookstoves have a low thermal efficiency, in the range 8-15% depending on their method of use. This results in significant demand for firewood, which causes large quantities of greenhouse gas (GHG) emissions and widespread deforestation and degradation of local forested areas.

Social Implications

Typical stove related tasks such as sourcing firewood, cooking and cleaning are predominantly undertaken by women. Moreover, the considerable time they spend collecting and carrying heavy bundles of firewood over long distances has resulted in physical health problems and exposure to dangers, such as wild animal attacks and sexual assault.

Economic Implications

Stove related tasks in total consume between an estimated 6 and 8 hours per day on average (refer to section 3.4). It also forms the primary role of female members in the communities. This minimises the time they have for undertaking more productive activities such as paid employment, agricultural work or spending time in education or training.

Improving The Situation

The Tramontana ICS-01 project, certified under the Verra Verified Carbon Standard (VCS), aims to use carbon finance to distribute up to 400,000 safe energy-efficient heavy-duty ICS. The ICS, which are manufactured locally in India, will be provided free of cost to households across multiple states of the country. The project specifically targets low income and socially disadvantaged indigenous communities, who are generally considered to be the most marginalised and underrepresented in Indian society. These communities have been unable to afford or access cleaner cookstoves primarily due to their economic circumstances and remote locations. The project aims to directly and immediately enhance the health, well-being and livelihoods of the communities, and particularly of women and children who are the most affected.

Implementation Plan

Tramontana has identified multiple target areas across several states of India which suffer from local deforestation and that are primarily populated with indigenous communities. A high proportion of the families in the project area own a Below Poverty Line (BPL) or ration support card issued by the government. This card indicates that the whole family has a maximum annual income of Rs 60,000 (or equivalent to approximately USD2 per day) (see section 1.13).

A distribution plan covering multiple instances under a group project has been developed. The initial instance is located in the state of Andhra Pradesh, from which the project can expand to other states including Odisha, Telangana and Chhattisgarh. The first project instance will distribute approximately 50,000 ICS after which multiple instances are planned according to the schedule presented in Table 1. Further information on the project location is provided in section 1.12.

[3] https://documents1.worldbank.org/curated/en/600391468771661997/pdf/ESM2760PAPER0Impact0of0Energy.pdf

The total GHG emissions reductions estimated from the project activity over the first crediting period is 13,632,220 tonnes of CO_2 equivalent (tCO_2e), with an annual average of 1,947,460 tCO_2e (see section 4.4).

Figure 2. Tramontana site visit to oversee ICS distribution and a recipient completing an ICS survey via the Tramontana ICS software application

Table 1. Planned distribution schedule of ICS across the project area corresponding to instances under the grouped project

Instance	Planned ICS Distribution
Region 1	50,000
Region 2	100,000
Region 3	100,000
Region 4	100,000
Region 5	50,000

1.2 Sectoral Scope and Project Type

The sectoral scope and project type applicable are:

Sectoral Scope: *03 – Energy Demand*

Project Type: *II – Energy Efficiency Improvement Project*

Grouped Project: *Yes*

1.3 Project Eligibility

The project involves energy-efficient cookstove distribution which falls under the sectoral scope 03 - *Energy demand* and is supported by a methodology approved under the VCS Program. The project activity also does not fall under any of the categories of excluded projects stated in the VCS Standard[4]. Therefore, the project is eligible under the scope of the VCS Programme.

1.4 Project Design

☐ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☒ **The project is a grouped project**

Eligibility Criteria

For the inclusion of new project activity instances, the Project Proponent must ensure that it meets the following eligibility criteria from the Verra VCS Standard, version 4.4[4]

Eligibility criteria	Compliance by new project instances
Meet the applicability conditions set out in the methodology applied to the project	All new instances under the grouped project will meet the conditions of the methodology as specified in section 3.2
Use the technologies or measures specified in the project description	The technology type employed is an energy efficient ICS to replace the traditional inefficient cookstoves used by households. Information on the ICS technology used for all instances is provided in the form of manufacturer product specifications, independent third-party certification for ICS thermal efficiency and through distribution data/photos.
Apply the technologies or measures in the same manner as specified in the project description	Only thermally efficient ICS will be distributed to households under project instances, and no other technologies will be adopted
Are subject to the baseline scenario determined in the project description for the specified	All new project instances will remain within the geographical boundaries of India and will therefore share some similar characteristics. However, given

[4] https://verra.org/wp-content/uploads/2022/12/VCS-Standard-v4.4-FINAL.pdf

Eligibility criteria	Compliance by new project instances
project activity and geographic area	each instance corresponds to a different area/region, separate baseline campaigns are conducted to ensure a more accurate representation of the respective region. The baseline scenario, including for the first instance, is discussed in section 3.4. Baseline data for subsequent instances is provided during verification.
Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area	All new project instances will have additionality characteristics consistent with the initial instance, and this will be demonstrated using the activity methodology below. Step 1: Regulatory Surplus Any new project instances included will not be mandated by any law, government policy or regulation in the host country Step 2: Positive List The inclusion of new project instances will comply with the positive list under the methodology (see section 3.5 for details) Step 3: Project Method Not applicable

1.5 Project Proponent

Organisation Name	Tramontana Impact Limited
Contact person	Dr Ramanan M. Loganathan
Title	Vice President
Address	2nd Floor, Gaspé House, 66-72 Esplanade, St. Helier, Jersey, JE1 1GH
Telephone	+44 (0)203 773 0160
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1.6 Other Entities Involved in the Project

Organisation Name	Cropzone Agro Forestry Private Limited
Role in the project	Project Participant
Contact person	Mr Saibaba Abburi
Title	Managing Director
Address	8-3-222/1/2, Ahmed House, Madhura Nagar, Hyderabad-500038, Telangana, India
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Email	saibaba@cropzone.in

1.7 Ownership

The project ownership is with the Project Proponent. All rights to carbon credits (or Verified Carbon Units under Verra) generated from project instances will be with the Project Proponent by means of a standardised licence agreement physically signed by the beneficiary of each ICS at the ICS distribution stage.

1.8 Project Start Date

21st January 2023 (The date of installation of the first ICS under the grouped project)

1.9 Project Crediting Period

The first crediting period is from 21st January 2023 to 20th January 2030, with seven-year renewable crediting periods. The total crediting period of the grouped project activity is 21 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emissions reductions for the project are

☐ <20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☐ 100,001 – 1,000,000 tCO_2e/year

☒ **>1,000,000 tCO_2e/year**

Project Scale	
Project	
Large project	✓

As the project is estimated to generate over 300,000 tCO_2e per year of emissions reductions, the project is considered large scale under the VCS standard.

The following are annual emissions reduction estimates from the project activity over the first crediting period. Details of the assumptions and calculations are provided in section 4.

Year	Estimated GHG emissions reductions (tCO_2e)
1	330,270
2	1,305,215
3	2,412,516
4	2,509,893
5	2,437,507
6	2,360,003
7	2,276,816
Total estimated ERs (first crediting period)	**13,632,220**
Average annual ERs	**1,947,460**

1.11 Description of the Project Activity

Household air pollution from traditional inefficient biomass cookstoves in rural homes is a leading cause of premature deaths in India (see section 1.1). Despite recent government efforts to promote cleaner cooking fuels (through schemes such as PMUY), challenges have occurred including uptake owing to high fuel costs (e.g. for LPG refills) and supply chain issues with fuel distribution to rural areas. The project activity enables the distribution of Tramontana ICS (Figure 4) directly to individual households in rural areas across multiple states in India. These ICS are provided free of cost, using carbon financing as the means to overcome a key hurdle for their adoption. They will replace traditional inefficient cookstoves, typically fixed mud clay stoves (made using mud, dung and brick or stone) (see Figure 1 and Figure 15) or three-stone stoves (see Figure 3), which use woody biomass as a fuel and have been utilised by the communities for generations.

Figure 3. A traditional three-stone cookstove and a community member in the project area using this stove type

The project is aimed primarily at households who are marginalised from a socio-economic standpoint. Many households belong to communities that have been statutorily recognised (in the Indian Constitution and Law) as Scheduled Castes and Scheduled Tribes (defined in Article 341 and 342 respectively of the Indian Constitution), which are considered the most disadvantaged socio-economic groups in India. The state government often provides documentation allowing these households to prove their community status, which in turn allows them to avail of several targeted welfare schemes such as subsidised food grains and preferential access to education and jobs. Note that evidence of such document is collected from ICS beneficiaries and stored electronically during the distribution phase of the project activity (see section 1.11.1).

The Tramontana ICS to be distributed forms a safe, portable cleaner cooking technology which can be (voluntarily) adopted by the communities and does not require them to make major modifications to their current cooking practices. The ICS has an increased thermal efficiency and completeness of combustion through its energy-efficient design, technology and the materials used. GHG emissions are immediately reduced, and families experience significant improvements in the levels of toxic indoor air pollution. The improved efficiency lowers deforestation/forest degradation (and consequently biodiversity loss) and enhances the daily lives particularly of female family members, who are most involved in carrying out the daily tasks relating to the stove.

A pilot study was conducted starting in January 2022, approximately one year in advance of distribution of the first ICS under the project. The study involved distributing 100 ICS within the project region and continuously monitoring usage and performance. This enabled the Project Proponent to make necessary ICS design improvements and incorporate feedback from community members. The pilot study also helped validate the robustness of the entire supply chain.

Figure 4. Tramontana ICS with unique serial number, QR code and Tramontana branding

Upon project implementation, as part of the ICS distribution process, the project team directly engage with each household and complete a number of tasks including:

- Provide physical demonstrations on how to use the Tramontana ICS
- Make recommendations on best practices including with fuel preparation (e.g. bark shredding, firewood sizing) and stove maintenance
- Hand over the assigned ICS together with an instructions brochure
- Use the Tramontana ICS software application to record an extensive set of data on the user (as outlined in section 1.11.1)
- Undertake post distribution checks in the weeks following distribution to assess initial performance and identify any issues

The technical specifications of the Tramontana ICS distributed under project activity instances is outlined in Table 2 and Table 3. These specifications will be used to determine emissions reductions for the project. If any additional ICS models are included in an instance in the future, their specifications will be provided during verification.

Table 2. Technical specifications of the Tramontana ICS distributed in the project area

ICS Model	CRS-23
Type	Natural Draft
Thermal Efficiency	36.01%
Height	25.5 cm

Diameter	27 cm
Weight	10.1 kg
Eligible Fuel Type	Wood, Charcoal, Other Biomass
Portable or Fixed	Portable
Colour / Finish	Black & White / Glossy
Expected Lifespan	7 years

Table 3. Material components of the Tramontana ICS distributed in the project area

ICS Part	Material	Thickness	Tolerance
Top Plate	Cold Rolled (CR) Steel	0.8 mm	+/- 0.1 mm
Grate	Cast Iron	6 mm	+/- 0.5 mm
Barrel/Combustion Chamber	Ceramic	23 - 65 mm (height variation)	+/- 2 mm
Bottom Ring	CR Steel	1 mm	+/- 0.02 mm
Neck (Outer Jacket)	CR Steel	0.6 mm	+/- 0.02 mm
Neck (Inner Lining)	Stainless Steel 430	0.6 mm	+/- 0.02 mm
Perforated Sleeve	CR Steel	0.6 mm	+/- 0.02 mm
Outer Jacket Cladding	CR Steel	0.6 mm	+/- 0.02 mm
Handles	Mild Steel wire covered with Bakelite	8 - 12 mm	+/- 2 mm
Pan Support	CR Steel	2 mm	+/- 0.02 mm
Legs	CR Steel	1 mm	+/- 0.02 mm
Fuel Stand	Mild Steel	4 mm	+/- 0.08 mm

1.11.1 Data collection from ICS end user

The Project Proponent will obtain the necessary information to identify households using its ICS during the course of the project. To facilitate this process, the Project Proponent has specifically developed the Tramontana ICS software application which is its own proprietary application on the Android operating system (OS) for conducting surveys. The application runs on portable tablets which are used by trained field staff specifically employed for the project. Each ICS (see details in Table 2 and Table 3) is assigned a unique serial code which is displayed on the device in writing and in the form of a QR code. For a new end user record as part of the registration process, the QR code is scanned using the Tramontana ICS software application and the following information is recorded. The information includes (as appropriate and as available):

- Name, phone number and photo of ICS beneficiary/head of household
- Address of ICS household
- Statutory Community Classification (if any)
- Pre-project cookstove type
- Photos of ID card and other certification
- ICS model
- GPS coordinates of ICS household
- Date and time of ICS installation
- Signed ICS licence agreement (including credit ownership)
- On-field distribution team member information including name, title and signature

Once a new user record is created in the Tramontana ICS software application it is automatically synced to a Google cloud database after the tablet is brought online. Figure 5 is a screenshot of a section of the application used for registration of new ICS beneficiaries.

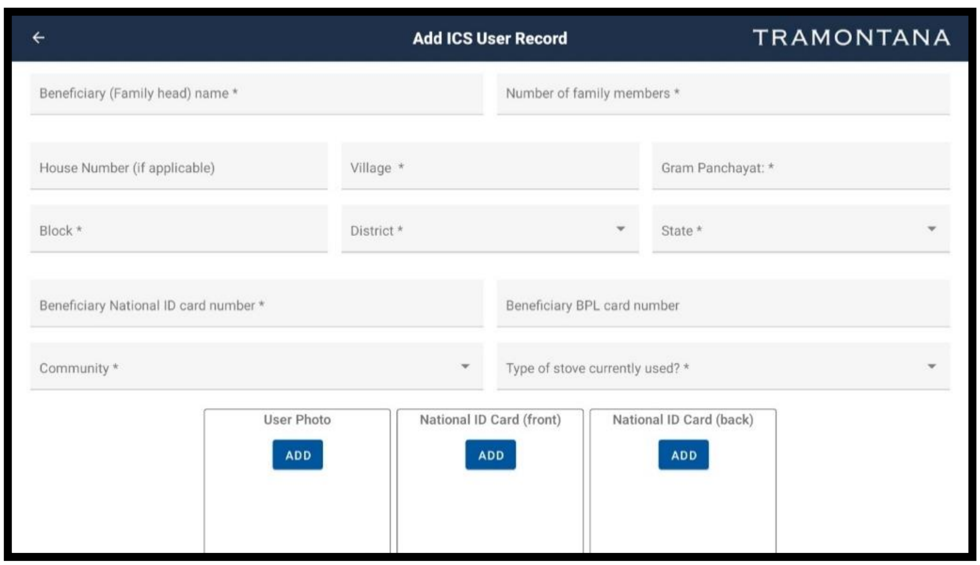

Figure 5. Screenshot from the new ICS user record section of the Tramontana ICS software application

All information collected/recorded including for baseline, registration and monitoring purposes is stored in the online database and subsequently automatically mapped into an Excel sheet. This sheet will serve as the basis for monitoring and auditing throughout the project life.

1.12 Project Location

All project activity under the grouped project is within the geographical boundaries of India depicted in Figure 6[5] with approximate coordinates of latitude 21.555808 and longitude 78.746972. The first project instance is within the Alluri Sitarama Raju (ASR) district of the state of Andhra Pradesh shown in Figure 7[6], with approximate coordinates of latitude 18.011959 and longitude 82.555030. The elevation of this region is approximately 1000 metres.

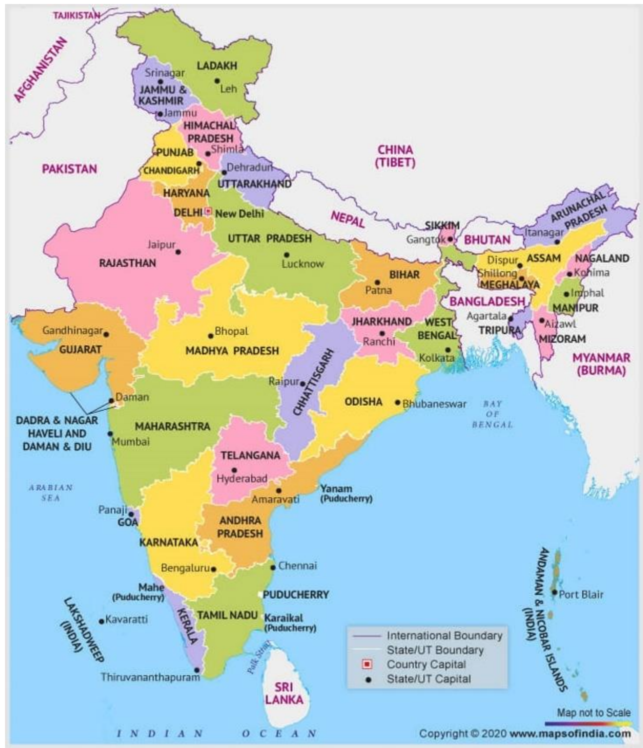

Figure 6. Project activity area of India delineated by state

[5] https://www.mapsofindia.com/images2/india-map.jpg
[6] https://www.india.com/news/india/andhra-pradesh-to-have-13-new-districts-from-april-4-check-list-of-total-26-districts-here-5317197

Figure 7. Map of Andhra Pradesh state in India divided by district where the first project activity instance is located (see blue arrow)

1.13 Conditions Before Project Initiation

The target communities live in rural areas and are predominantly from indigenous and socio-economically disadvantaged communities. They rely on nature for their livelihoods, and reside in environments ranging from forests to hills with many in difficult-to-access remote areas. The level of education is generally low and many children lack access to schools or drop out early due to having to focus on helping out the family. Most families own a Below Poverty Line (BPL)/ration card issued by the state government confirming eligibility to receive food provisions, subsidies etc, which in Andhra Pradesh (and similarly in other states) is only handed to those households with a maximum annual income for the whole family of less than Rs 60,000 (or equivalently USD2 per day approximately) amongst other conditions[7]. Documentary proof of this, where available, is collected during ICS distribution and recorded in the project database.

The pre-project baseline scenario is the continued use of rudimentary traditional cookstoves by the communities, typically in the form of fixed mud clay stoves (Figure 1 and Figure 15) or three-stone stoves (see Figure 3). Usage of these stoves has been commonplace in the project areas for generations, where households burn woody biomass to meet their thermal energy needs including for the purposes of cooking, heating and boiling water. These cookstoves are considered to have a low thermal efficiency, in the range 8-15% depending on their method of use according to the World Bank[8]. Further, their poor design results in incomplete combustion which releases significant quantities of toxic air pollutants into the immediate environment. This causes issues such as breathlessness, coughing, headaches, burning eyes and longer term respiratory/retinal issues in the target communities, particularly as users (mainly women) spending long hours in close proximity to the stoves, and in many cases within a confined environment.

[7] https://www.civilsupplies.ap.gov.in/AnnIV-Iss-BPL.jsp

[8] https://documents1.worldbank.org/curated/en/600391468771661997/pdf/ESM2760PAPER0Impact0of0Energy.pdf

The large firewood requirement of traditional stoves results in significant generation of GHG emissions and deforestation/degradation of the local forested areas (see Figure 8). It further leads to considerable time spent collecting firewood, which prevents primarily female family members from undertaking alternative income generating and skill development activities. Given the heavy loads are carried by headload and for many kilometres, it also causes physical health problems as well as exposure to dangers from the local area including sexual assault and wild animal attacks. To gain further insight into the pre-project conditions, baseline surveys are conducted for each project activity instance under the grouped project. Details for the first project instance can be found in section 3.4.

Figure 8. Community member chopping trees to collect firewood to carry home and evidence of recent deforestation in the local area as result of large firewood demand

Under the project activity, all beneficiaries will communicate information on their pre-project stove when receiving a new ICS, with responses recorded in the distribution database. There will also be a requirement for demolishing or removing pre-project cookstoves as a condition for receiving a new ICS in order to minimise any chances of reverting to the previous stove.

1.14 Compliance with Laws, Statutes, and Other Regulatory Frameworks

There exists no mandatory law or regulations requiring the introduction or use of ICS in India. The project is undertaken on a voluntary basis by the Project Proponent.

1.15 Participation in Other GHG Programs

1.15.1 Projects Registered (or seeking registration under Other GHG Program(s))

The project is not registered or seeking registration under any other GHG programs

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG programs

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The proposed project activity is not included in an emissions trading programme or any other mechanism that includes emissions trading

1.16.2 Other Forms of Environmental Credit

The project activity has not sought or received any form of GHG-related environmental credits

1.17 Sustainable Development Contributions

The project contributes to environmental, social, economic and technological benefits which lead to the sustainable development of the local area and country as follows:

Environmental Benefits

- Preservation of forest stock and protection of ecosystems, habitats and soil health by reducing the rate of deforestation and forest degradation across the project area
- Reduction in toxic indoor air pollution from the cleaner combustion characteristics and increased thermal efficiency of the project ICS. This lowers health issues from respiratory and other diseases. Communities also save on medical expenditure and require less time off to look after unwell family members.
- Lower GHG emissions generated by a reduction in the use of non-renewable biomass
- Less water and effort needed for cleaning utensils and maintenance of the household as a result of the cleaner cooking process and minimised smoke/soot generation

Social Benefits

- Reduced drudgery and exposure to risks including wild animal attacks, sexual assault, injuries from tree cutting/wood chopping etc. that are prevalent in the project area, as a result of less time needing to be spent sourcing, carrying and processing firewood. These issues were widely reported in baseline surveys for the first project instance (see section 3.4).
- More hours for skill/economic development and schooling owing to reduced time spent sourcing firewood
- Improvement to gender equality as it is primarily women that carry out the tasks relating to stove usage, firewood collection and cleaning
- Improved home conditions and quality of life for families by reducing localised indoor air pollution and from the time savings
- Enhanced safety and reduced burns/injuries for children owing to the compact nature of the Tramontana ICS and less direct exposure to the flame
- Confidence and comfort as no material change is required to traditional cooking practices
- Development of IT skills for the local teams employed as a result of training and experience gained under the project activity

Economic Benefits

- Employment opportunities and skill development for the local communities and economy through the project activity. This includes specifically employing and training local teams for operational tasks such as distribution, monitoring, maintenance, data analysis and conducting stakeholder meetings.
- More hours available for productive income generating activities and schooling as a result of reduced household work and fuel sourcing
- Reduced expenditure on firewood (if purchased) due to the increased thermal efficiency of the Tramontana ICS

Technological Benefits

- Introduction of cleaner technology directly to rural communities
- Employment of local workers and provision of training and experience in the use of tablets with an Android software application to conduct baseline surveys, distribution and monitoring work
- Provision of training and experience in IT for local office teams to undertake the tasks around project data compilation and analysis

1.17.1 Sustainable Development Goals

Nine of seventeen global UN Sustainable Development Goals (SDGs) have been identified as relevant to this project and are illustrated with black boxes below. Table 4 provides further details on each of these SDGs including the relevant baseline scenario and corresponding contribution from the project activity. Information is also provided on how each SDG contribution will be measured through the project life.

Table 4. Information on relevant SDGs for the project including outlining the baseline scenario as well as the corresponding contribution from the project activity and monitoring approach

SDG Target	SDG Indicator[9]	Baseline Scenario	Net Impact on Indicator	Contribution of Project Activity and Monitoring Approach
 NO POVERTY	1.2.1 Proportion of population living below the national poverty line, by sex and age 1.4.1 Proportion of the population living in households with access to basic services	The majority of the households in the target communities belong to those that have been statutorily recognised (in the Indian Constitution and Law) as coming from the most disadvantaged socio-economic groups in India. The communities typically own a Below Poverty Line (BPL)/ration government card signifying a maximum annual family income of Rs 60,000 or equivalently USD2 per day approximately (see section 1.13). The communities are currently using rudimentary inefficient and highly polluting traditional stoves to meet their thermal energy needs. They are unable to purchase an ICS primarily due to lack of access and affordability,	Positive	Under the project activity, ICS will be distributed to rural communities that are considered the most disadvantaged socio-economic groups in India. The ICS will provide them with access to clean cooking technology which is considered a basic service for all families/households. In addition, it also reduces the time spent by families in undertaking stove related tasks and therefore allows more time for: income generating activities (e.g. supporting in the main work contributing to the family's income), activities to help with skill development, and community work, which can all improve the family's livelihood. The impact on this SDG can be assessed by first identifying the number of households owning a BPL/ration card through survey responses and documentary proof (where available) in the distribution database. Then subsequently, the number of households

[9] www.sdgdata.gov.uk

		and thus live without the means to access basic services including clean cooking.		from these community categories that have received and are using an ICS, based on distribution and monitoring database records.
GOOD HEALTH & WELL-BEING	3.9.1 Mortality rate attributed to household and ambient air pollution	The poor design of traditional stoves used in the target communities results in incomplete combustion of the firewood which releases significant toxic air pollution into the local environment as smoke, soot and other PM. This has contributed to a prevalence of respiratory and retinal issues, and premature deaths in the local communities as users (mainly women) spend long hours in close proximity to the stoves. Further observations on the baseline scenario are given in sections 1.13 and 3.4.	Positive	The improved quality and design of the Tramontana ICS results in an immediate improvement in the levels of smoke/soot generation and toxic indoor air pollution, therefore contributing to improved home conditions for families. Additionally, the portable nature of the ICS provides flexibility in the location of use, which can be for instance elsewhere together with the family or outside. The increased efficiency of the ICS means less time is spent sourcing and carrying firewood. This means less of the negative physical and social issues associated with these tasks, and more time with the family and for pursuing alternative tasks. The impact on this SDG can be assessed using the data collected as part of monitoring surveys, which has been specifically designed to gain extensive user feedback on areas including ICS usage/performance, changes in local conditions and impact on general well-being. The information is presented in the monitoring database and reports.

QUALITY EDUCATION	4.3.1 Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex 4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	The socio-economically disadvantaged target communities have limited support, access or even time available to be able to undertake formal education or skill development/training. Instead, much of the time of family members is spent helping to carry out tasks for the purposes of survival, such as firewood gathering, cooking/heating, cleaning, agricultural labour for subsistence purposes etc.	Positive	As part of the project activity field staff and coordinators from the local community are employed for the purposes of data collection and community engagement for pre-baseline/baseline work, stakeholder meetings, ICS distribution and monitoring. Extensive training programmes are conducted in preparation, which includes: gaining experience in using an Android software application on tablets for surveying, learning techniques for data acquisition and data quality control, and setting up and hosting stakeholder meetings. The coordinators are given in-depth training to be able to oversee large groups, provide guidance/mentorship and be able to help tackle any issues faced. Local office teams are also employed and trained under the project to undertake IT tasks around data compilation and analysis, which occurs once field data is submitted and uploaded to the online database. Each household that becomes a beneficiary of an ICS is educated on areas such as climate change/sustainability, sustainable stove usage practices, ICS design and benefits, firewood preparation, maintenance/repair etc and is provided with continuous support and engagement throughout the project life.

				The impact on this SDG can be assessed through the number of local staff employed and trained for the purposes of carrying out the project activity. Records of all staff will be maintained in a database. In addition, information on the specific member of the field team that surveyed an individual record for baselines, distribution and monitoring is also recorded in the project database, which will give insight into the skill and experience gained by each team member.
GENDER EQUALITY	5.2.2 Proportion of women and girls aged 15 years and older subjected to sexual violence by persons other than an intimate partner in the previous 12 months, by age and place of occurrence 5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location	It is primarily female members of families that spend a disproportionate amount of time carrying out the daily tasks (unpaid work) around stove preparation and usage. This makes them the most exposed to the negative aspects of stove related tasks including pollution, physical pain and social issues. It also prevents female family members from being able to undertake other activities that provide skill development, generate income or support the local community.	Positive	Though the ICS project activity alone is unable to alter/balance the role of family members in carrying out the daily tasks, it can drastically reduce the negative impacts associated with firewood collection/preparation and stove usage which is undertaken mainly by the female members. This includes issues such as sexual assault which is commonly experienced during collection of firewood. The reduced negative impact is achieved as result of the improved quality, design and efficiency of the Tramontana ICS, and via the education provided on sustainable practices. Separately, the local field and office teams employed and trained as part of the project activity has a good female representation. The impact on this SDG can be assessed by first determining from the baseline

				database, which family members are carrying out stove related tasks as well as any issues that are faced during firewood collection, and then from monitoring surveys understanding whether beneficiaries are actually experiencing environmental, social and economic benefits. Survey responses focussed on here include changes experienced in the time to collect firewood, and any improvements observed in user health/well-being. In addition, the SDG impact is also assessed through the number of female members recorded as employed and trained as part of the project activity.
7 AFFORDABLE AND CLEAN ENERGY AFFORDABLE AND CLEAN ENERGY	7.1.2 Proportion of the population with primary reliance on clean fuels and technology 7.a.1 International financial flows to developing countries in support of clean energy research and development and renewable energy production,	There are approximately 600 million people in India that still have a continued reliance on solid fuels (mainly firewood) as a cooking fuel (see section 1.11) and do not have access to cleaner energy sources. Across the project area usage of rudimentary traditional inefficient cookstoves by the communities has been commonplace for generations. Households under the project belong to communities that have been statutorily recognised as	Positive	The Project Proponent supporting this project is an international company based outside of the project region. Through their investment into distributing high quality, efficient ICS free of cost, the target communities can directly and immediately experience the benefits of using cleaner energy/technology and without the need to significantly change their daily practices. The free of cost nature is particularly advantageous for the poor marginalised communities, who would otherwise not be able to afford cleaner technologies. The local communities are also educated on sustainable cooking practices and the

	including in hybrid systems	suffering from socio-economic deprivation, and therefore have also been unable to afford any cleaner forms of energy		importance of adopting such methods to preserve the environment. This will aid beneficiaries in maintaining use of their ICS as well as make more informed decisions in the future. The impact on this SDG can be assessed by multiplying the number of households that are using an ICS by the household size, to determine the total number of people under the project that have switched and are benefiting from cleaner energy/technology. The household size is determined at the distribution stage and the number of stoves operating can be identified from monitoring survey results for the period.
DECENT WORK AND ECONOMIC GROWTH	8.5.2 Unemployment rate, by sex, age and persons with disabilities 8.6.1 Proportion of youth (aged 15–24 years) not in education, employment or training	The marginalised target communities have limited access to skilled jobs and development opportunities given their remote locations, the low-quality of resources/infrastructure available to them, and the minimal outside support. Most people work in subsistence for their families in areas such as agriculture and have very little income, as confirmed by the Below Poverty Line (BPL)/ration	Positive	The project activity has resulted in new jobs, training and skill development for local people. Specifically, local field and office staff have been employed and supported with extensive training, including: gaining experience using tablets and an Android software application, with data entry/acquisition and analysis, and in event set up and hosting for stakeholder meetings and community engagements. In addition, opportunities for coordinator roles have been given to more experienced individuals. The project promotes decent work conditions for all by ensuring continuous support, fair wages and benefits, training, safety, and

		card issued to them by the state government.		opportunities for career development. This can lead to a strong positive impact on the livelihoods of local workers and their families, and greater social and economic development/growth in the communities. Outside of the local project areas, many more people are employed (both directly and indirectly) to support the project activity, including manufacturers, transport and logistics etc All these service providers are located within the project boundary of India and thus the project activity contributes to national development and growth. The impact on this SDG can be assessed by observing the records of all persons employed (full-time and part time) under the project activity. Employment information is also obtained from outside service providers where possible. In addition to employment data, other information is collected such as attendance records for all training sessions, number of tablets deployed, stakeholder event details including local speakers and organising staff.

RESPONSIBLE CONSUMPTION AND PRODUCTION	12.2.2 Domestic material consumption, domestic material consumption per capita, and domestic material consumption per GDP	The unsustainable practices employed across the project area and low thermal efficiency of traditional baseline cookstoves (in the range 8-15% as discussed in section 1.13) has resulted in the overuse of non-renewable biomass, thereby depleting precious local natural resources including forests (see for instance Figure 8). As these practices are widespread across the project area, the negative impact on local resources is significant.	Positive	The Tramontana ICS distributed across the project region has an improved design/durability and significantly higher thermal efficiency as compared with the baseline stove. This results in an immediate reduction in the consumption of firewood, estimated to amount to an approximate 60% reduction by mass. This sizeable reduction for all project households will also lead to less time needing to be spent carrying out stove-related tasks including firewood sourcing, carrying and preparation work. Local communities are also educated to adopt sustainable practices and maximise resource efficiency going forward. The impact on this SDG can be assessed by calculating the total mass of firewood saved through the project activity. This is determined by multiplying the firewood consumption reduction per stove by the number of operating stoves observed from monitoring surveys. The firewood reduction calculation is based on the methodology and uses the ICS technical specification plus data from baseline surveys.

CLIMATE ACTION	13.2.2 Total greenhouse gas emissions per year	Rudimentary traditional cookstoves which are poorly designed and considered to have a low thermal efficiency are widely used across the project area. This results in significant GHG emissions being generated and incomplete combustion leading to localised toxic air pollution in the form of smoke, soot and other PM.	Positive	The replacement of traditional cookstoves with the efficient Tramontana ICS through the project activity will result in an immediate reduction in GHG emissions (and localised air pollution). GHG emissions reductions will occur throughout the lifetime of the project. As an ex-ante estimate based on calculations in section 4, the annual GHG emissions reductions over the first crediting period is 1,947,460 tCO_2e. The impact on this SDG can be assessed by calculating and verifying the emissions reductions that occur from the operational ICS in each monitoring period. As this is the primary task behind the generation of carbon credits (or Verified Carbon Units under Verra), the SDG does not require any additional monitoring to that already undertaken as part of monitoring/verification under the project activity.
LIFE ON LAND	15.1.1 Forest area as a proportion of total land area 15.2.1 Progress toward sustainable forest management	The firewood used by cookstoves across the project area is typically sourced by family members directly from natural forested areas (3.31km away on average in the first project instance as indicated in section 3.4). It is obtained by directly	Positive	The reduction in firewood consumption by the Tramontana ICS as result of its higher thermal efficiency, leads to a meaningful increase in the preservation of forest stock, associated ecosystems, wildlife habitats and soil health through the reduced rate of deforestation and forest degradation. Local communities are also educated in

	15.3.1 Proportion of land that is degraded over total land area	cutting down forest trees, sorting the wood and then carrying it home by headload and processing. The firewood obtained is non-renewable (see section 3.2), thereby contributing to deforestation and forest degradation across the region (as shown in Figure 8). This has been occurring over generations with little effort to replenish the land through sustainable activities such as replanting.		stakeholder meetings and various community engagements on sustainable practices and the importance of its adoption to minimise critical forest loss. The impact on this SDG can be assessed by calculating the total mass of firewood saved through the project activity and subsequently estimating the amount of forested area preserved. As with SDG 12, the mass of firewood saved corresponds to the product of the firewood consumption reduction per stove and number of operating stoves as determined from monitoring surveys.

1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable as the project adopts a net gross adjustment factor of 95% to account for leakage in line with the methodology (see section 4).

Commercially Sensitive Information

All information for the purposes of project description and project implementation is included in this report which is made publicly available.

2 SAFEGUARDS

2.1 No Net Harm

The proposed project activity results in positive environmental, social and economic benefits, as outlined in section 1.17. Given no disadvantages have been identified for the project, this section is not applicable.

2.2 Local Stakeholder Consultation

The objective of the stakeholder consultation is to present the Tramontana ICS-01 project to the local communities and gather feedback. This mainly involves highlighting the project objectives, the key benefits, the stakeholders involved, as well as direct engagement and undertaking question/answer sessions with the communities.

The ICS project is designed to distribute 400,000 ICS across multiple states of India, as a grouped project with separate project instances. Multiple stakeholder consultations will be conducted for each project instance to ensure engagement with the communities in each area. The project has also been structured in such a way that people from the local area are employed as field staff and coordinators. This is important to be able to properly connect with the local communities and understand their needs, alongside being able to support local people by providing them with employment and training. These local employees also play a key role in organising and conducting the stakeholder meetings.

Prior to stakeholder meetings, a pre-baseline assessment is first carried out to identify potential eligible households in villages and engage with the communities to assess current practices and issues faced. The households that are eligible to receive an ICS must meet all project conditions under the standards/selected methodology and be contained within the project boundary. Once an area is scoped out and the preliminary data is collected, the project team can proceed to organising stakeholder meetings and baseline surveys.

All potential beneficiaries of an ICS within a *mandal* (i.e. a local subdivision of a district of which there are 11 in the first project instance) are invited to attend in-person stakeholder meetings, which are advertised in advance through newspapers (example shown in Figure 9), radio, social media, invitations and/or word of mouth. At each meeting, banners in the local language containing information on the project and the Tramontana ICS are displayed around the venue. Every attendee is provided with a physical brochure (presented in Figure 10) containing similar information and also offered refreshments during the meeting. Several special guests are invited to the meetings including MPs, District Collectors, Community Presidents etc. These guests have a strong presence in the local area, knowing the local community well and having a good understanding of the challenges faced.

Figure 9. Newspaper advertisement for first stakeholder meeting of first project instance held on 14th November 2022 in Paderu

All stakeholder meetings are conducted following local customs/traditions and in the local language, which for the first instance in Andhra Pradesh is Telugu. In each meeting the Project Proponent and other local stakeholders are first introduced by a member of the team. Then a detailed presentation is given on the project, including the main objectives and a comprehensive (non-technical) overview of the ICS including highlighting the social (particularly for women), economic, and environmental benefits of adoption. Further, an outline is given of the distribution/monitoring phases of the project and the underlying carbon credit-based financing. One other aspect of the presentation is the emphasis on the responsibilities of all households with regards to correct and continued ICS use, together with the support recipients will receive regarding repairs and replacements. Following the main presentation, each special guest in turn gives a speech providing their own insight on the project and impact on the local community. Finally, attendees are given the opportunity to ask questions or share any concerns directly with the project team through a microphone handed to them.

The size of each stakeholder meeting is dependent on the mandal population and response rate. A full list of all attendees at each meeting is recorded, including their signatures, contact number and address. In addition, the minutes of every meeting (including stakeholder questions and our responses) is recorded and documented (in English).

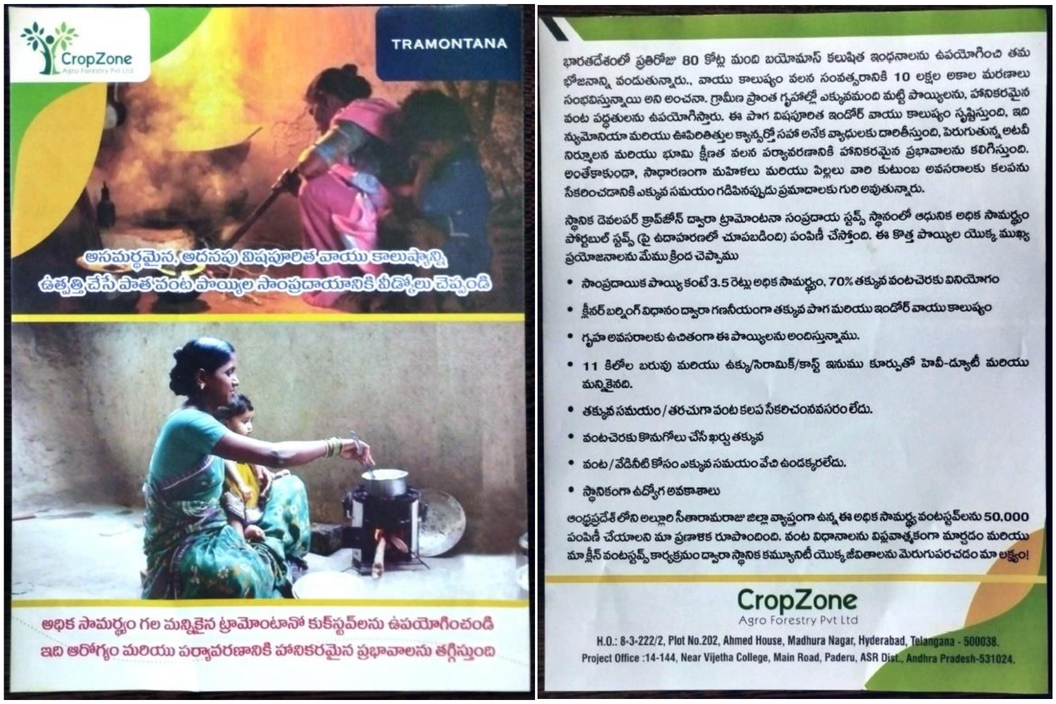

Figure 10. Brochure in the local language distributed at stakeholder meetings providing information on the project and ICS including its benefits

Any concerns or questions stakeholders may have following a meeting, can be directly reported to the local mandal representative or voiced through a dedicated phone number. These formats are suitable given many local people in the communities are illiterate and unable to express their feedback in written format. All points raised will be added by the team to a local grievance register. The information in the register will be reviewed on a regular basis by the Project Proponent, with all valid concerns addressed and incorporated into the project.

The stakeholder consultations for the first instance comprising of 11 mandals across the Alluri Sitarama Raju (ASR) district of Andhra Pradesh mainly occurred between 14th November 2022 and 4th December 2022. Figure 11 illustrates a newspaper article discussing one of the stakeholder meetings. On average two meetings were conducted per mandal which ensured a uniform and extensive consultation with community stakeholders. The schedule which was followed for the first project instance, which included a total of 2219 attendees, is outlined in Appendix 1. Meetings with a similar format and structure will be undertaken across all project instances.

పెన్ పవర్
PEN POWER NEWS
తెలుగు దిన పత్రిక
ప్రశ్నించడం మన హక్కు
8th ANNIVERSARY

సంపుటి : 9 సంచిక : 68 పేజీలు 10 సంపాదకులు : జి.ఎ.రావు (ఆనంద్ గంట్యాడ) ప్రచురణ : విశాఖపట్నం మంగళవారం, 15 నవంబర్ 2022 వెల : 5/-రూ॥
VOLUME : 9 ISSUE : 68 PAGES :10 EDITOR : G. A. RAO (ANAND GANTYADA) PUBLISHED : VISAKHAPATNAM TUE 15 NOVEMBER 2022 PRICE : 5/- RS

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ట్రామోటనా కుకింగ్ స్టవ్వుల మహిళలకు ఎంతో మేలు

ఎంపిపి: రత్న కుమారి

స్టాఫ్ రిపోర్టర్ పెన్ పవర్,పాడేరు:నవంబర్14:ట్రామోంటనా కంపెనీ తయారు చేసిన పొగరాని పోయిలు ప్రస్తుత పరిస్థితుల్లో మహిళలకు ఎంతగానో ఉపయోగపడుతుందని పాడేరు ఎంపిపి ఎస్. రత్న కుమారి గృహిణులను ఉద్దేశించి ప్రసంగించారు. సోమవారం క్రాప్ జోన్ సంస్థ ఎం డి సాయి బాబా ఆధ్వర్యంలో మండల కేంద్రంలో మార్కెట్ యార్డ్ ఆవరణలో పొగరాని పోయిల ఆవశ్యకత పై మహిళకు అవగాహన కల్పించేందుకు సదస్సు ఏర్పాటు చేశారు. ఈ కార్యక్రమానికి ఎంపిపి ఎస్. రత్నకుమారి, మేజార్ పంచాయతీ సర్పంచు కొట్టగుల్లి.ఉషారాణి ముఖ్య అతిధులుగా హాజరై ముందుగా ఎంపిపి మహిళలను ఉద్దేశించి పైనపేర్కొట్లు ప్రసంగించారు.కాలుష్యానికి అనుగుణంగా,ప్రస్తుత టెక్నాలజీ కి అనుగుణంగా, శ్రమ నివారణ, తక్కువ కట్టెలతో ఎక్కువ రోజులు కాల్చుకొనేటట్లు ఈ పొగరాని పోయిలు అందుబాటులో రావడం మహిళలకుశుభపరిణామామని అన్నారు. ఉషారాణి మాట్లాడుతూ.. కాలని కట్టేలాతో మన పూర్వీకులు కావచ్చు, మన అమ్మ నాన్న కావచ్చు, ఇప్పటి వరకు మారుమూల గ్రామలో కట్టే పోయిలతోనే వంటకాలు అష్ట కష్టాలతో చేస్తున్నారని, వంటలు ఆలస్యం కావస్తుందని కన్నీళ్లు పెట్టుకున్న సందర్భాలు లేక పోలేదని ఈసందర్భంగా గుర్తు చేశారు. కావున చక్కటి అవకాశం వచ్చినందుకు ప్రతి మహిళ సద్వినియోగం చేసుకోవాలని కోరారు. అనంతరం క్రాప్ జోన్ ఎం డి సాయి బాబా మాట్లాడుతూ.. ఈ సంస్థ ప్రత్యేకంగా మహిళల శ్రమ గుర్తించి, కాలుష్య నియంత్రణ, కట్టెలు కొట్టుకొంటు పోతే ఆక్సిజన్ లేకుండా పోతుందని దాని స్థానంలో మొక్క నాటడం, పెరిగిన చెట్లు కొట్టడం జరుతుందని, అంతే కాదు ఈ ప్రాంత మహిళలు ఊరు చివర కొండల్లో వెళ్లి వారి శ్రమంత ఉపయోగించి కట్టెలు తెస్తున్నారని కానీ శ్రమకు తగిన ఫలితం లేదని వారి శ్రమ పలితనికే ఈ పొగరాని పోయి అని తక్కువ కట్టెలు ఎక్కువ లాభసాటిగా ఉందని, ఆరోగ్య సమస్యలు లేకుండా సంతోషం గా మహిళలు వంటావార్పు చేసుకొనే వెసులుబాటు ఉందని అన్నారు. కంపెనీ వీటి ధర రూ..1500/-లుగా ప్రకటించిందని అన్నారు. గ్యాస్-సిలిండర్ వాడే వారికి ఇవ్వబోమని స్పష్టం చేశారు. ఈ కార్యక్రమానికి మాజీ ఎంపిపి ఎస్ వి వి రమణ మూర్తి రాజు, క్రాప్ జోన్ సిబ్బంది రమేష్,లక్ష్మణ్, అధిక సంఖ్యలో మహిళలు పాల్గొన్నారు.

Figure 11. Local newspaper article discussing one of the stakeholder meetings conducted

The stakeholder meetings for the first project instance (see Figure 12) were all successfully conducted. The project gained a very positive reception and overwhelming support from the local communities across all 11 mandals. All invited special guests were also keen advocates of the project activity, communicating their strong support for it and highlighting the importance of such an initiative for marginalised and underrepresented communities. Many reiterated the message that the Project Proponent is the first ever organisation to provide significant support to their local community and that the improved cooking technology will be life changing.

Figure 12. Stakeholder meetings depicting a Tramontana presentation, special guest speech, high turnout, attendance sheet signing, community questions and ICS demonstration

Attendees were given the opportunity to ask questions or raise their concerns during (and after) all stakeholder meetings. All points raised and corresponding responses were noted in maintained minutes from each stakeholder meeting. Some examples of questions raised by attendees are outlined in Table 5. No negative comments were made by attendees with regards to the project activity, and thus no changes were required to the general project design or operation.

All information recorded from meetings including detailed minutes, attendance sheets, stakeholder questions and photos are made available for the Validation and Verification Body (VVB) and Verra.

Table 5. Some of the questions raised by local community members and the responses given by the project team for various stakeholder meetings in the first project instance

Name of attendee	Question	Local coordinator response
Vanthala Lavanya from Baski village (Araku Valley)	How do traditional cookstoves and the Tramontana ICS differ?	As highlighted in the presentation, unlike traditional cookstoves which produce a lot of toxic localised air pollution and are low in quality, Tramontana ICS are made using steel/ceramic and fully combust the firewood to generate more heat and less smoke. It also saves time on fuel gathering for the family as there is an estimated 60% reduction in firewood requirement. A list of the advantages can be seen in the brochure provided and on the banners displayed around the venue. You can discuss further details with any of the local representatives present here following this meeting.
G. Chandramma from Y.N Pakalu village (Koyyuru)	How do we fire up these ICS?	The Tramontana ICS can be fired up in the same way as your current cookstoves. The advantage is that you do not need to drastically change the way you cook or use the stove. We will provide instructions verbally and in a brochure format with every ICS during distribution, as well as give physical demonstrations, to help you safely and effectively operate and maintain the ICS. Also, a contact number will be provided in case you are having any issues or require advice.
B. Kondamma from Pedalochali village (G. Madugula)	How much weight can be put on the Tramontana ICS for cooking?	We estimate you can put up to 15 kg of weight on the Tramontana ICS, which should be more than sufficient to support cooking (and other activities) for the entire family.

D. Saraswathi from Dokuluru village (Paderu)	If there are 10 members in a family, how will a single ICS be sufficient?	A single ICS may in fact be sufficient due to its increased thermal efficiency and higher cooking capacity. However, we will consider providing an additional stove if the amount of firewood you are currently using is significantly higher than the average family in the community. For this we would have to take further fuel weight measurements and other details for evaluation[10].
Konudi Pushpalatha from Dabavalasa village (Hukempeta)	How long are the Tramontana ICS under warranty?	The average lifespan of the Tramontana ICS is estimated to be 7 years. We will provide you with a contact number at the time of distribution which you can contact if at any time you are experiencing problems with your ICS. We will provide maintenance, repair and replacement services due to any malfunction or damage to the ICS free of cost. Our team will also conduct at least annual household visits to ensure you are using the ICS and are satisfied with it.

2.3 Environmental Impact

No negative environmental impacts were identified for the project. An Environmental Impact Assessment (EIA) is not required for the project as there are only positive environmental outcomes.

2.4 Public Comments

This section is to be filled after the completion of the 30-day public comment period

2.5 AFOLU-Specific Safeguards

This section is not applicable as the project is a non-AFOLU project

[10] See section 4.4 for details on accounting for multiple devices per household in emissions reduction calculations

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VCS Methodology: *VMR0006 Methodology for Installation of High-Efficiency Firewood Cookstoves, version 1.2*[11]

The methodology also refers to the latest version of CDM *AMS-II G - Energy efficiency measures in thermal applications of non-renewable biomass, version 13.0*[12]

To calculate the fraction of non-renewable biomass we use CDM *Tool 30: Calculation of the fraction of non-renewable biomass, version 4.0*[13]

3.2 Applicability of Methodology

Applicability criterion	Justification
Project activities must introduce efficiency improvements in thermal applications of non-renewable biomass in the following premises: households, community-based kitchens, institutions (e.g. schools) or small and medium sized enterprises (SMEs)	The project activity involves the distribution and installation of energy efficient ICS in rural households in India which use non-renewable biomass
The project stove must have specified high-power thermal efficiency of at least 25% as per the manufacturer's specifications and must exclusively use woody biomass and can be single pot or multi-pot; in case of the project stove replacing fossil fuel (i.e. coal/kerosene) baseline stove, it must exclusively use renewable biomass	The Tramontana ICS installed under the project activity is a high-quality single-pot portable cookstove, which uses woody biomass as a fuel input in line with manufacturer specifications. The ICS has an efficiency of 36.01% obtained through independent verification via laboratory testing conducted at the Department of Mechanical Engineering at Jorhat Engineering College (see certificate in Appendix 2). Any new ICS models which may be included in future instances will also meet the requirements of this methodology criteria.

[11] https://verra.org/wp-content/uploads/2023/03/VMR0006-Methodology-for-Installation-of-High-Efficiency-Firewood-Cookstoves-v1.2_DRAFT.pdf
[12] https://cdm.unfccc.int/methodologies/DB/GNFWB3Y6GM4WPXFRR2SXKS9XR908IO
[13] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf

	Note that the fuels used by baseline stoves under the project activity are not considered fossil fuels.
Project activities characterised as *Projects* and *Large Projects* can apply this methodology	The project activity involves the distribution of 400,000 ICS across India and the estimated annual average GHG emissions reductions generated from this is 1,947,460 tCO_2e (see section 4). As a result, the project meets the condition of *Large project* under the standard (which corresponds to over 300,000 tCO_2e per annum) and therefore can apply this methodology.
Non-renewable biomass has been used in the project region since 31st December 1989, using survey methods or referring to published literature, official reports or statistics	According to the UN Food and Agriculture Organisation, there was significant demand for firewood in India observed over the period 1970 to 1995 (Table 6), and also a large percentage share of the energy consumption in rural households coming from firewood (Table 7). The high demand has been a key driver of forests being cleared/degraded, as presented in the State of Forestry reports from Forest Survey of India[14]. Over the period 1993 to 1997, 671,000 hectares or equivalently over 1% of total forest cover (dense and open forests) was lost in India. In addition, 1,831,000 hectares of dense forests was either degraded or destroyed. In the first project instance location of Andhra Pradesh, the total forest cover loss over the same period was estimated to be 396,600 hectares. Therefore it is clear that biomass from non-renewable sources has been in use in the project region since at least as far back as 31st December 1989.

[14] https://fsi.nic.in/index.php

For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), (i) it must be demonstrated that the fuel is produced using exclusively renewable biomass (more than one type of biomass may be used) (ii) the consumption of fuel should be monitored during the crediting period and (iii) energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded	This condition is not applicable as the project activity does not use processed biomass residues as a fuel. Instead, the activity involves reducing the consumption of non-renewable biomass by replacing traditional cookstoves with high quality thermally efficient ICS.
The VCS project document shall explain the proposed method for the distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo)	Each ICS installed under the project shall be identifiable by the Project Proponent logo and a unique serial number which is displayed on the ICS itself as a QR code and in written form. This is linked to individual users using the Tramontana ICS software application which scans the QR code and records corresponding beneficiary information including personal details, address, date of installation, geolocation of household, user/ID photos etc (see section 1.11.1 for full list). The data will be verifiable by the VVB through an online database of distribution records. These project design measures eliminate the risk of double counting. Further details on the ICS distribution process can be found in section 1.11.
The VCS project document shall also explain how the proposed procedures prevent double counting of emission reductions, for example, to avoid that project stove manufacturers, wholesale providers or others claim	A standardised licence agreement is signed physically (with written signature or thumbprint) by each ICS beneficiary which includes (amongst other conditions) provisions for ownership of all emissions reductions generated by the ICS to be solely with the Project Proponent. The licence agreement is

credit for emission reductions from the project devices	generated though the Tramontana ICS software application on a tablet which is then signed by the end user (see Figure 2). A signed pdf copy of all agreements is made available in the online database. No other stakeholders or parties involved in the project have any rights to the carbon credits generated from the GHG emissions reductions.

Table 6. Total firewood demand in India over the period 1970 to 1995[15]

Year	1970	1975	1980	1985	1990	1995
Firewood Demand (million m^3)	154.99	173.36	194.42	214.49	237.63	260.77

Table 7. Estimate share of energy consumption of firewood in rural households[16]

Type	% share in 1978 -79	% share in 1992-93
Firewood logs	18.95	32.49
Firewood twigs	35.62	29.11

3.3 Project Boundary

The boundary for the grouped project can be represented by the geographical boundary of India as presented in Figure 13 and also outlined in section 1.12.

Each project instance will also have its own separate defined boundary within the overall boundary of the grouped project. For the first project instance this corresponds to the Paderu division of the Alluri Sitarama Raju district of Andhra Pradesh depicted in Figure 7 and represented by approximate coordinates of latitude 18.011959 and longitude 82.555030.

[15] https://www.fao.org/forestry/statistics/80570/en
[16] https://wgbis.ces.iisc.ac.in/energy/HC270799/RWEDP/acrobat/fd49.pdf

Figure 13. Delineation of geographical boundary (red) within which all activity under the grouped project is contained

The greenhouse gases to be included in the project boundary are presented in the table below and the corresponding impact of introducing the Tramontana ICS is illustrated in Figure 14.

Source		Gas	Included?	Justification/Explanation
Baseline	Emissions from the use of non-renewable biomass	CO_2	Yes	Major source of emissions
		CH_4	Yes	Major source of emissions
		N_2O	Yes	Major source of emissions
		Other	No	No other sources identified
Project	Emissions from the use of non-renewable biomass	CO_2	Yes	Major source of emissions
		CH_4	Yes	Major source of emissions

		N_2O	Yes	Major source of emissions
		Other	No	No other sources identified

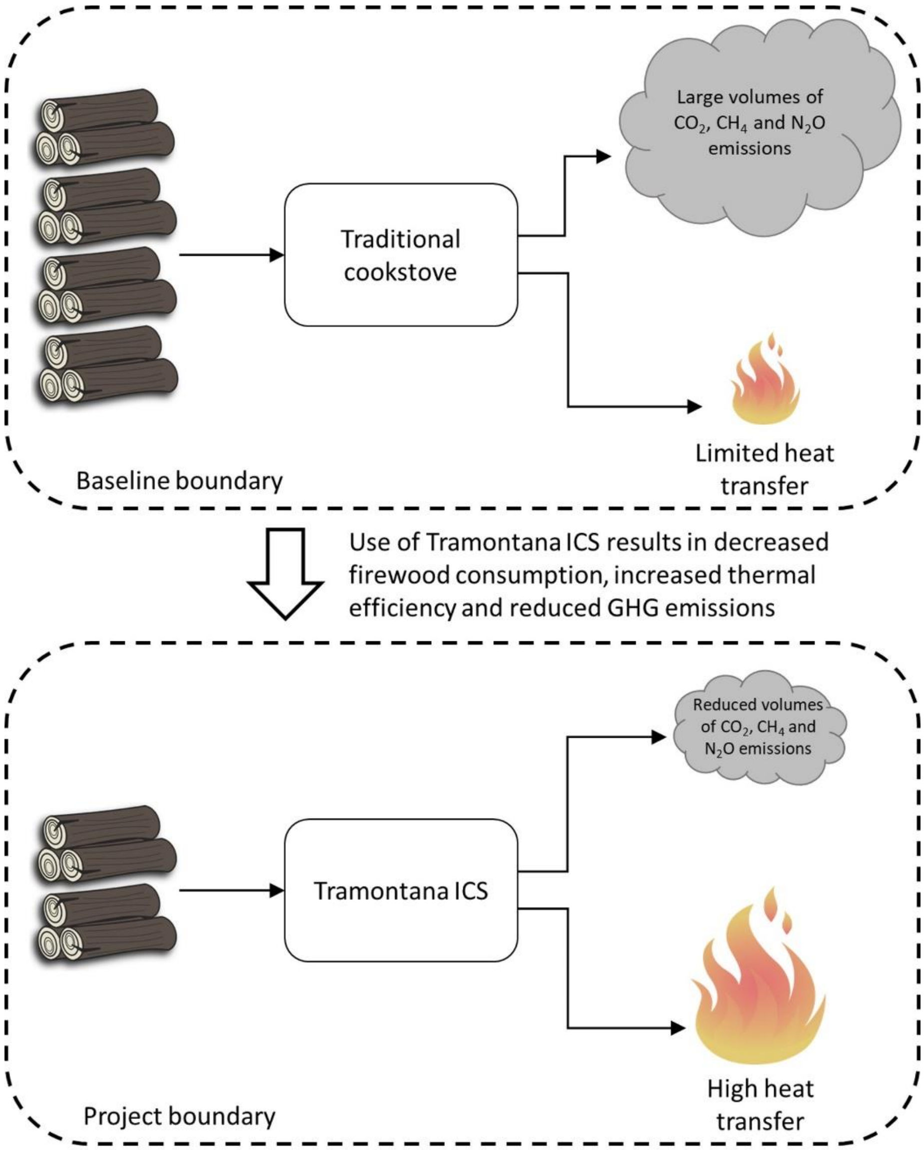

Figure 14. Depiction of the impact of introducing the Tramontana ICS on GHG emissions, firewood consumption and thermal efficiency in the project region

3.4 Baseline Scenario

The baseline or pre-project scenario is the continued use of woody biomass by local communities to meet their thermal energy needs such as for cooking, heating and boiling water. Use of rudimentary traditional cookstoves is prevalent, most commonly in the form of fixed mud clay stoves (Figure 1 and Figure 15) or three-stone stoves (Figure 3). Usage of these stoves has generally been commonplace in the project areas for generations. Some broader information on the baseline scenario is provided in sections 1.11 and 1.13.

Despite all project activity instances sharing some comparable characteristics, separate baseline surveys are to be conducted for each instance in order to gauge an accurate representation of the current practices in that specific region. A similar approach to the baseline surveys conducted for the first project instance outlined below will be followed for other instances.

For the first project instance, baselines surveys were conducted across 11 mandals in the Alluri Sitarama Raju district of Andhra Pradesh. This occurred between 3rd November 2022 and 12th December 2022 following the corresponding local community stakeholder consultations (see section 2.2). Pre-baseline surveys were initially conducted to estimate the approximate number of potential ICS beneficiaries in each village. Using this data, a sampling framework was able to be devised with a minimum sample size requirement of 100 as per the simplified approach outlined in section 5.3. Applying random sampling to the pre-baseline data to identify villages to be included in the baseline, and with significant oversampling to maximise reliability, approximately 3.5% of all potential beneficiaries for the instance were identified and interviewed as part of baseline surveys. This amounted to in total 1800 baseline surveys being conducted over the period.

To understand the baseline situation across the project instance area, detailed surveys were conducted which recorded information including: respondent family details (which includes the role of each member in stove usage/fuel sourcing), current stove usage practices, fuel collection and consumption patterns (with measurements), the current issues faced and the perception of adopting a new ICS. All surveys were carried out by trained local field teams employed for the project, using tablets containing the Tramontana ICS software application. All baseline records were signed, submitted and successfully synced to a Google cloud database before being automatically translated into an Excel sheet. The sheet was then checked by an office team to identify any incorrect entries and immediately have them resurveyed. The final sheet is made available to the VVB and Verra for the purposes of validation.

From the baseline survey results for the first project instance, it is found that the vast majority of families (80%) are using traditional fixed mud clay stoves and the remainder (20%) use three-stone stoves. Over 85% of survey respondents are using their stove inside the household. We have measured that an average of 18.53 kilograms per day (or equivalently 6.76 tonnes per annum) of firewood is being consumed per stove, with all respondents confirming that wood as their only fuel source. In all cases firewood is obtained directly from forests, and in a small number of cases (1%) it is also purchased on occasion from other community members that have already collected it from forests. Every user carries their firewood by headload and the average distance from the source location was found to be 3.31km. In general, the distance to the source location has been increasing year-on-year as forest areas closer to households have been deforested.

The traditional stoves are used an average of 4.5 hours per day all year round (with minimal change across seasons) for the purposes of cooking, boiling water and in many cases (83%) also room heating. Note that in 10% of the cases individuals also used their stoves to prepare food/beverages for sale. In addition to the above, an estimated 12 – 15 hours per week is spent sourcing, carrying and processing (e.g. cutting, shredding) the firewood, which highlights the overall time-consuming nature of stove related tasks. It is exclusively women who were using the stoves (aside from a few cases where no women lived in the household), with the firewood gathering also undertaken by them, sometimes with the help of other family members. Generally, it was clear that stove-related activities formed the primary role of female members in the community.

Over 98% of respondents stated that they were not happy with their current stove and accordingly very few stated that it was not a priority to change. All participants confirmed that they did not own an ICS and would be interested to receive a new ICS if offered one.

A number of key issues were widely reported across the baseline surveys. These included: regularly experiencing wild animal attacks in the forest (including snakes, bears, boars and dangerous insects), injuries when cutting wood using tools/axes, sexual assault, allergies from exotics plant species, toxic localised smoke causing retinal and breathing issues, and physical pain in undertaking the physically demanding tasks of cutting trees, carrying firewood long distances in hilly areas and sitting in a fixed position adjacent to the stove for prolonged periods.

Almost all respondents stated that there is a lot of localised smoke produced by their traditional stoves, that the associated tasks are time consuming giving little time for other activities, and that a large quantity of firewood is required to be regularly collected/used. Despite all respondents knowing that kitchen smoke has a negative impact on health, they have little ability to control it. When questioned on why they use traditional stoves which have such issues, the main reasons given were that they are not aware of any other stoves, alternative fuel sources are too expensive, firewood is abundantly available and/or that their current stove has been at least manageable in terms of handling/maintenance.

All baseline respondents confirmed having a Below Poverty Line/ration card, and over 99% confirmed availability in physical form at the time of surveying. Where available these cards will be photographed at the time of ICS distribution. Finally, over 98% of the respondents stated that their family's main work is in agriculture and the total income per family was found to average out to under a US dollar a day.

Figure 15. Baseline scenario depicting a traditional mud clay stove, firewood being transported by headload, cooking using a traditional stove and Tramontana meeting with ICS beneficiaries from a local indigenous community

3.5 Additionality

The methodology uses the Activity Method to demonstrate additionality. This involves:

Step 1: Regulatory Surplus

The project is designed and implemented on a voluntary basis by the Project Proponent and therefore it is a voluntarily coordinated action.

There is no mandated government program or policy in the host country of this project ensuring the distribution of domestic fuel-efficient cookstoves. The project is also not mandated by any law, statute, or other regulatory frameworks, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or other regulatory framework.

Step 2: Positive List

The positive list represents the applicability conditions (outlined below) from the methodology which must be satisfied for a project to be deemed additional.

Condition 1: The project activity devices must be distributed with zero cost to the households or end users for the entire project period and there shouldn't be any sources of revenue other than from the sale of GHG credits

Condition 2: The project activity shouldn't be considered as additional if it is implemented by any government schemes or multilateral funds. Although the stoves are distributed free of cost or at a high subsidized rate it is not eligible to use this methodology

The project ICS (and any other ICS that may be included in future instances) will be distributed and licenced to beneficiaries free of charge under the project activity, with no sources of revenue generated from the project activity other than from the sale of GHG carbon credits. The project activity is independently undertaken by the Project Proponent on a voluntary basis and is not affiliated with any government schemes or supported by multilateral funds. As the project activity satisfies applicability conditions 1 and 2 above, it can be deemed as being additional.

Step 3: Project Method

Not applicable as the ICS are provided free of charge to all end users

3.6 Methodology Deviations

The project activity has not taken any deviations from the applied methodology VMR0006.

4 QUANTIFICATION OF GHG EMISSIONS REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emissions reductions achieved by the project. Please refer to section 4.4.

4.2 Project Emissions

The methodology does not account for project emissions separately, but instead quantifies net emissions reductions achieved by the project. Please refer to section 4.4.

4.3 Leakage

Leakage will be estimated using a default factor 0.95 in accordance with the AMS-II G methodology. This value is considered conservative, as there is little incentive for non-project users to switch fuels or increase consumption given that woody biomass is already generally widely available and zero cost across the project region.

4.4 Estimated Net GHG Emissions Reductions and Removals

ICS are introduced as an energy efficiency measure in the project, therefore Equation 1 and Equation 2 of the methodology VMR0006 are applied to calculate the net GHG emissions reductions.

$$\boldsymbol{ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y} \quad \textbf{Equation 1}$$

where

i	=	Indices for the situation where more than one type/model of ICS is introduced to replace baseline stoves
j	=	Indices for the situation where there is more than one instance of ICS of type i
ER_y	=	Emissions reductions during year y in tCO_2e
$ER_{y,i,j}$	=	Emissions reductions for ICS of type i in instance j during year y in tCO_2e
LE_y	=	Leakage emissions in year y in tCO_2e

$$ER_{y,i,j} = B_{y,sav,i,j} \times NCV_{wood\_fuel} \times \left(EF_{wf,CO2} + EF_{wf,nonCO2}\right) \times f_{NRB} \times N_{y,i,j} \quad \textbf{Equation 2}$$

where

$B_{y,sav,i,j}$	=	Quantity of woody biomass saved in tonnes by an ICS of type i in instance j during year y
f_{NRB}	=	Fraction of woody biomass that can be established as non-renewable biomass
NCV_{wood_fuel}	=	Net calorific value of the non-renewable woody biomass that is reduced
$EF_{wf,CO2}$	=	CO_2 emissions factor for the use of wood fuel in the baseline scenario
$EF_{wf,nonCO2}$	=	Non-CO_2 emissions factor for the use of wood fuel in the baseline scenario
$N_{y,i,j}$	=	Number of ICS of type i in instance j operating during year y (with a deduction applied for any non-operational ICS based on monitoring survey results)

To account for leakage of project emissions reductions LE_y through diversion of non-renewable biomass to non-project households that previously used renewable sources, a discount factor of 0.95 is applied to $ER_{y,i,j}$ in Equation 2 in line with the AMS-II G methodology.

Following the methodology, the quantity of woody biomass saved due to the installation of ICS is estimated using

$$B_{y,sav,i,j} = B_{old,adj} \times \left(1 - \frac{\eta_{old}}{\eta_{new,y,i}}\right) \quad \textbf{Equation 3}$$

where

η_{old}	=	Efficiency of the baseline cookstove
$\eta_{new,y,i}$	=	Efficiency of ICS of type i for year y determined through a water boiling test (WBT) or applying a default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent through the life span of the project device
$B_{old,adj}$	=	Parameter B_{old} adjusted to account for the ex-post usage of firewood with baseline (or other) cookstoves by households alongside the ICS

Note that

$$\boldsymbol{B_{old,adj}} = \boldsymbol{B_{old}} \times (\boldsymbol{1} - \boldsymbol{u_y})$$ **Equation 4**

where

B_{old}	=	Annual quantity of woody biomass which would have been used by the baseline cookstove in the absence of the project activity in tonnes
u_y	=	Baseline stove usage factor to adjust for any use of baseline (or other) cookstoves alongside the ICS

Note that equation 4 from the methodology corresponding to the B_{new} method for calculating biomass savings is not applied here and can be excluded. Also renewable biomass as a fuel source is not used or available resulting in the exclusion of equation 6 from the methodology.

Though unlikely, if at any time a household requests to receive more than one ICS owing to, for example a very large family size, the Project Proponent will consider the request and evaluate upon collecting further details. This would include additional information on ICS/fuel usage patterns, including undertaking fuel weight measurements. In the case of deciding to distribute more than one ICS to a household, the following calculation from the methodology is applied to determine the baseline fuel consumption per device.

$$\boldsymbol{B_{old}} = \frac{\boldsymbol{B_{old,H}}}{\boldsymbol{n}}$$ **Equation 5**

where

$B_{old,H}$	=	Annual quantity of woody biomass which would have been used by the household in the absence of the project activity in tonnes
n	=	Number of ICS distributed to the household

The following assumptions are applicable for the project activity to help estimate ex-ante emissions reductions:

- Project activity installs up to 400,000 ICS across the project region
- Commencement of ICS installation for a project activity instance is considered as the operational date of that project instance, and the date of installation of the last ICS within an instance determines the expected operational lifetime of the instance
- An expected average lifespan for an ICS of 7 years. This can be extended with regular maintenance, and information on any lifetime extensions will be reported during monitoring.
- An annual stove loss rate of $L = 0$, as the project aims to provide maintenance of all ICS and repair/replace in case of any damage or stove failure. Any issues found by an ICS user can be communicated in person or through a dedicated contact number provided. A physical check is also undertaken with every household at least once a year. Note that the parameter L exists for ex-ante calculation purposes only and is not

directly determined for the project. Instead it is incorporated within the parameter $N_{y,i,j}$ which is monitored through the project life.

- B_{old} calculated based on averaging the baseline surveys conducted prior to ICS installation for each instance. Here it is estimated as 6.77 tonnes per year which corresponds to the output for the first project activity instance (see section 3.4).
- A value of $\mu = 0$ as all pre-project stoves are aimed to be removed or demolished when beneficiaries receive a new ICS. The value of this parameter for the project will however be based on actual monitoring survey records where on-site checks are undertaken for use of pre-project (or other) stoves.
- A ramp-up schedule defined for ICS distribution with 100,000 over the first year followed by 200,000 per annum for subsequent years, reaching a total of 400,000 ICS
- A single ICS model distributed across the entire project area and therefore i fixed. Note that if at a later date, an additional ICS model is included or an improvement is made to the existing ICS, it will be detailed as part of the monitoring report and correspondingly accounted for in emissions reduction calculations.
- For simplicity, ex-ante calculation workings in this section do not delineate project instances j

To determine the number of ICS operating during year y for ex-ante calculation purposes, we use

$$\boldsymbol{N_{y,i,j} = N_{i,j}\,(1 - y_l L)}$$ **Equation 6**

where

$N_{i,j}$	=	Total number of ICS of type i in instance j
L	=	Annual loss rate of stoves in the project area
y_l	=	Years of operation

Applying Equation 6 with the distribution schedule stated above with single stove type, for example for $y = 2$,

$$N_{2,1} = 100{,}000 \times (1 - 2 \times 0) + 200{,}000 \times (1 - 1 \times 0) = 300{,}000$$

Therefore, the expected number of ICS operating each year is

$\boldsymbol{y}$	$\boldsymbol{N_{y,1}}$
1	100,000
2	300,000
3	400,000
4	400,000

5	400,000
6	400,000
7	400,000

The stove efficiency $\eta_{new,y,i}$ is determined through regular water boiling tests (WBTs) conducted through the project life, as discussed in section 5. However, for the purposes of ex-ante calculations, we apply a 3% linear annual reduction factor to estimate the efficiency of the project ICS in each year y as

$\boldsymbol{y}$	$\boldsymbol{\eta_{new,1}}$
1	34.93%
2	33.85%
3	32.77%
4	31.69%
5	30.61%
6	29.53%
7	28.45%

Based on these annual ICS efficiency estimates, Equation 3 and Equation 4 are applied to determine the mass of woody biomass that is saved by an ICS in tonnes each year.

Using a value of $\mu = 0$ and $B_{old} = 6.77 \text{ tonnes}$ determined from baseline surveys, we have

$$B_{old,adj} = 6.77 \times (1 - 0)$$

$$= 6.77 \text{ tonnes}$$

Then with $\eta_{old} = 0.15$ in line with the methodology, and using the value for $\eta_{new,1}$ for $y = 1$ as an example from the table above,

$$B_{1,sav,1} = 6.77 \times \left(1 - \frac{0.15}{0.3493}\right)$$

$$= 3.863 \text{ tonnes } (3 \text{ d.p.})$$

Similarly applying the formulation to determine the biomass savings per stove for each year

$\boldsymbol{y}$	$\boldsymbol{B_{old,adj}}$ (t)	$\boldsymbol{\eta_{new,1}}$	$\boldsymbol{\eta_{old}}$	$\boldsymbol{B_{y,sav,1}}$ (t)

1	6.77	0.3493	0.15	3.863
2	6.77	0.3385	0.15	3.770
3	6.77	0.3277	0.15	3.671
4	6.77	0.3169	0.15	3.565
5	6.77	0.3061	0.15	3.452
6	6.77	0.2953	0.15	3.331
7	6.77	0.2845	0.15	3.200

Finally, to determine the emissions reductions in year y, Equation 1 together with Equation 2 is employed using the fixed parameters outlined as follows.

Table 8. Fixed parameters and their source to calculate emissions reductions under the methodology

Parameter	Value	Source
B_{old}	6.77 tonnes	Baseline Surveys (for each instance)
η_{new_s}	36.01%	Manufacturer, Independent laboratory test
η_{old}	15%	Methodology
NCV_{wood_fuel}	0.0156 TJ/tonne	Methodology
$EF_{wf,CO2}$	112 tCO_2/TJ	Methodology
$EF_{wf,nonCO2}$	9.46 tCO_2/TJ	Methodology
f_{NRB}	0.95	Baseline Surveys (see section 5)

To provide an example of using Equation 1 and Equation 2 with the parameters outlined in Table 8, for $y = 1$

$$ER_{1,1} = 3.86273.. \times 0.0156 \times (112 + 9.46) \times 0.95 \times 100{,}000 \times 0.95 \times 0.5$$

$$= 330{,}270 \ tCO_2e$$

Note that the factor 0.95 here accounts for leakage of project emissions reductions as discussed earlier in the section. An additional factor 0.5 is applied given ICS distribution occurs throughout the year, and this will be applied for other years in line with the ICS distribution ramp-up schedule stated earlier. Note accordingly that a factor 0.75 is to be used specifically for year 3 as distribution is planned only over the first half of the year.

Applying the emissions reduction formulation for the proposed project activity over the first crediting period

y	$B_{y,sav,1}$ (t)	$N_{y,1}$	$ER_{1,y,1}$ (tCO_2e)	$ER_{2,y,1}$ (tCO_2e)	$ER_{3,y,1}$ (tCO_2e)	ER_y (tCO_2e)
1	3.863	100,000	330,270	–	–	330,270
2	3.770	300,000	644,674	660,541	–	1,305,215
3	3.671	400,000	627,761	1,289,348	495,406	2,412,516
4	3.565	400,000	609,696	1,255,523	644,674	2,509,893
5	3.452	400,000	590,354	1,219,391	627,761	2,437,507
6	3.331	400,000	569,598	1,180,709	609,696	2,360,003
7	3.200	400,000	547,265	1,139,196	590,354	2,276,816

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emissions reductions or removals (tCO_2e)
1 (21-January-2023 to 20-January-2024)	330,270	0	0	330,270
2	1,305,215	0	0	1,305,215
3	2,412,516	0	0	2,412,516
4	2,509,893	0	0	2,509,893
5	2,437,507	0	0	2,437,507
6	2,360,003	0	0	2,360,003
7	2,276,816	0	0	2,276,816

Total	$13,632,220$	0	0	$13,632,220$

The estimated annual average GHG emissions reductions over the first crediting period is $\mathbf{1,947,460\ tCO_2}$**e.**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	f_{NRB}
Data unit	*Fraction*
Description	Fraction of woody biomass saved by the project activity that can be established as non-renewable biomass
Source of data	Calculated by determining the share of non-renewable woody biomass in the total quantity of woody biomass consumed in the project region. The value is obtained from baseline survey results for each instance. Specifically, from the proportion of participants recorded as sourcing firewood from forests and failing to employ sustainable practices. To make this number conservative, a factor of 0.95 is then applied to the value output. For the first instance, it was recorded that all participants sourced firewood from forests. Communities were also not aware of sustainable practices and therefore do not implement them. This has caused widespread deforestation across the region through the significant firewood demand (as shown for example in Figure 8). Applying the factor 0.95, a final parameter value of 0.95 is obtained for the first project instance.
Value applied	0.95
Justification of choice of data or description of measurement methods and procedures applied	The value as per CDM *Methodological Tool 30: Calculation of the fraction of non-renewable biomass*[17] is calculated using $f_{NRB} = \frac{NRB}{NRB + RB}$ where NRB is the quantity of non-renewable biomass consumed in tonnes and RB is the quantity of renewable biomass in tonnes in the region

[17] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf

Purpose of data	Calculation of emissions reductions
Comments	--

Data / Parameter	NCV_{wood_fuel}
Data unit	$TJ/tonne$
Description	Net calorific value of the non-renewable woody biomass
Source of data	Value obtained from the *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 Energy, Chapter 1 Introduction*
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	As per methodology guidelines
Purpose of data	Calculation of emissions reductions
Comments	--

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO_2/TJ
Description	CO_2 emissions factor for the use of wood fuel in the baseline scenario
Source of data	As per methodology guidelines
Value applied	112

Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of data	Calculation of emissions reductions
Comments	--

Data / Parameter	$EF_{wf,nonCO2}$
Data unit	tCO_2e/TJ
Description	Non-CO_2 emissions factor for the use of wood fuel in the baseline scenario
Source of data	As per methodology guidelines
Value applied	9.46
Justification of choice of data or description of measurement methods and procedures applied	--
Purpose of Data	Calculation of emissions reductions
Comments	--

Data / Parameter	η_{old}
Data unit	*Fraction*
Description	Efficiency of baseline cookstove
Source of data	Methodology
Value applied	0.15

Justification of choice of data or description of measurement methods and procedures applied	Default value for the baseline device which is a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney, or three-stone fire using firewood (not charcoal)
Purpose of data	Calculation of emissions reductions
Comments	If at any point charcoal is found to be used by baseline devices within an instance, a value of 0.25 will be applied in line with the methodology

Data / Parameter	η_{new_s}
Data unit	*Fraction*
Description	Efficiency of the project ICS at the start of the project activity
Source of data	Manufacturer specifications and independent verification from laboratory water boiling tests (WBTs) conducted by the Department of Mechanical Engineering at Jorhat Engineering College (see Appendix 2)
Value applied	36.01%
Justification of choice of data or description of measurement methods and procedures applied	WBTs involve averaging the cold-start and hot-start high-power phases of an ICS[18]
Purpose of data	Calculate emissions reductions
Comments	The efficiency value corresponds to the Tramontana ICS to be distributed under project activity instances. In case of inclusion of any new ICS models, the corresponding model efficiency will be used for emissions reduction calculation purposes.

Data / Parameter	B_{old}
Data unit	*Tonnes per year*

[18] https://cdm.unfccc.int/methodologies/SSCmethodologies/clarifications/21559

Description	Annual quantity of woody biomass which would be used by a household in the absence of the project activity to meet their thermal energy needs
Source of data	Measurement from Baseline surveys
Value applied	For the first project instance in Andhra Pradesh conducted between November and December 2022, an average value of 18.54 kg per day was obtained for each baseline stove, which is equivalent to 6.77 tonnes annually
Justification of choice of data or description of measurement methods and procedures applied	This parameter is determined at the project instance level. The calculation is based on an average of all baseline sample surveys conducted for the respective project instance. Each survey value is determined by first asking each stove user in the sample baseline to physically gather the amount of firewood consumed each day (or over a defined period) and subsequently having a member of the field distribution team directly take a measurement of the weight using either analogue or digital scales. The value of the parameter is determined once for each project instance and remains fixed for the entire project period. It is calculated after baseline surveys are carried out, but prior to ICS installation given all baseline stoves are aimed to be removed/demolished during the distribution process. Baseline data is gathered extensively and uniformly across a project instance with samples collected from all over the district. Baseline sampling is described in section 3.4.
Purpose of data	Calculation of emissions reductions
Comments	If at any point charcoal is found to be used by baseline devices within an instance, a wood-to-charcoal conversion factor of 4 will be applied in calculations in line with the methodology

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	*Number*

Description	Number of project devices of type i in instance j operating during year y
Source of data	Installation database and monitoring surveys
Description of measurement methods and procedures to be applied	After initially creating a complete database of distribution records, the parameter is monitored based on representative sampling. As per the methodology, the sampling complies with the latest version of CDM guidelines[19]. A % retention rate is calculated based on sampling which is then applied to the initial total number of ICS distributed of type i in instance j.
Frequency of monitoring/recording	Expected every 6 months and at least annually
Value applied	Based on results from monitoring surveys Aiming for all ICS distributed to be operational owing to regular maintenance/repair and replacement if necessary
Monitoring equipment	Surveys using tablets with the Tramontana ICS software application
QA/QC procedures to be applied	A phone number is provided to every end user to contact in case of any issues faced with their ICS, so that the Project Proponent can have them resolved imminently. The project aims to exceed the required sample confidence threshold through using techniques such as oversampling
Purpose of data	Calculation of emissions reductions
Calculation method	Based on sample-based monitoring, the parameter is obtained by multiplying the proportion of operational ICS by the total commissioned ICS as follows $N_{y,i,j} = \frac{n_{op,y,i,j}}{n_{tot,y,i,j}} \times N_{tot,i,j}$ where N = number of ICS in population n = number of ICS based on sample

[19] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

	op means operational, tot means total
Comments	--

Data / Parameter	$\eta_{new,y,i}$
Data unit	*Fraction*
Description	Thermal efficiency of ICS of type i in year y
Source of data	Water boiling tests (WBTs) as part of monitoring
Description of measurement methods and procedures to be applied	The parameter is measured by conducting WBTs involving averaging the cold-start and hot-start high-power phases of an ICS. In line with the methodology, for an ICS of type i and vintage y a sample from the first ICS batch of 3 ICS are selected and for each one 3 WBTs are conducted. The degradation of efficiency measured from monitoring the first ICS batch may be applied across all batches. The WBTs will be conducted by an independent technical laboratory and certified test results will be provided as part of monitoring.
Frequency of monitoring/recording	Annual
Value applied	Based on an average of the results from the WBTs
Monitoring equipment	Laboratory tests
QA/QC procedures to be applied	Experienced technical laboratories are selected for the purposes of conducting all WBTs The test results from the 9 samples must meet the standard deviations limit and 90/10 confidence/precision as set by the methodology, else more sample tests will be undertaken until the requirement is met. This is discussed further in section 5.3.
Purpose of data	Calculation of emissions reductions
Calculation method	For an ICS of type i and vintage y, the parameter is determined by averaging the results from independent WBTs conducted on a sample of 3 operational ICS

Comments	--

Data / Parameter	u_y
Data unit	*Fraction*
Description	Stove usage adjustment factor accounting for any continued use of pre-project or other devices
Source of data	Monitoring surveys
Description of measurement methods and procedures to be applied	As the B_{old} method is used in emissions reduction calculations, this parameter forms a part of the methodology (equations 3 and 5 of the methodology). During distribution the signed end user agreement includes provisions to remove or demolish the pre-project stoves from households eligible for a new ICS. This is expected to be enforced and therefore the value for this parameter is expected to be 0. To check for any pre-project or other devices being used, sample-based monitoring will be applied as described in section 5.3. If it is found that a non-project stove is being used following conducting a monitoring survey, the parameter u_y is calculated for the corresponding user as the ratio of the frequency of usage of the non-project stove compared to the frequency with which all stoves are used by the household over a defined time period. For instance, if it is found from surveys that a non-project stove is being used 7 times per week and the ICS is being used 21 times a week, the following calculation would be applied u_y = 7 / (21 + 7) = 0.25
Frequency of monitoring/recording	Expected every 6 months and at least biennially
Value applied	0 unless pre-project or other devices are found to be used
Monitoring equipment	Surveys using tablets with the Tramontana ICS software application
QA/QC procedures to be applied	--

Purpose of data	Calculation of emissions reductions
Calculation method	A parameter value of zero if only project ICS are being used, otherwise apply the follow calculation over a defined time period $u_y = \frac{f}{F + f}$ where f = frequency of non-project stove usage F = frequency of project ICS usage
Comments	--

Data / Parameter	*Life Span*
Data unit	*Number of years*
Description	Operating lifetime of project ICS
Source of data	Manufacturer specifications
Description of measurement methods and procedures to be applied	All ICS are manufactured to a fixed specification/error tolerance (see Table 3) and quality control checks are undertaken by the field teams prior to distribution to ensure that the ICS have standardised dimensions and no damage. A one-year warranty is also provided by the ICS manufacturer.
Frequency of monitoring/recording	Once at project installation
Value applied	7
Monitoring equipment	--
QA/QC procedures to be applied	--
Purpose of data	--
Calculation method	--

Comments	It is considered that the project device may be in operation beyond 7 years with proper maintenance and this will be checked and reported during monitoring. If the lifespan of a project device ends up being shorter than 7 years, either it will be proven that the device has been replaced, or if no replacement has occurred there will be no emissions reductions claimed

Data / Parameter	*Date of commissioning of project device i and the corresponding instance j*
Data unit	*Date and instance number*
Description	Exact date of installation at household of each individual ICS and the project instance to which it belongs
Source of data	Distribution database
Description of measurement methods and procedures to be applied	--
Frequency of monitoring/recording	Once at ICS installation
Value applied	--
Monitoring equipment	Surveys using tablets with the Tramontana ICS software application
QA/QC procedures to be applied	--
Purpose of data	Calculation of emissions reductions
Calculation method	--
Comments	--

5.3 Monitoring Plan

A sampling plan is required for the purposes of monitoring and verification of project emissions reductions. As per CDM guidelines[20] a sampling plan specifically contains (i) a sample design/sizing and field data and (ii) an implementation plan and data quality control.

5.3.1 Sample design/sizing and Field data

The target population includes all households under the grouped project who are having their traditional stoves replaced by a new Tramontana ICS. Owing to the large number of ICS planned to be distributed under the project, representative sampling of the population is applied, in line with the CDM sampling guidelines.

The objective of sampling is to obtain an unbiased statistically significant estimate of the lifecycle variables to be monitored from the population, presented in Table 9, for the purposes of emissions reduction calculations over the course of the project period. The parameter type column specified in the table corresponds to either *proportion* or *mean value* as per the methodology guidelines.

The parameter $\eta_{new,y,i}$ in Table 9 is monitored using a separate approach outlined in the methodology. More specifically, an average is calculated from 9 samples undertaken (3 ICS with 3 WBTs conducted for each), with sampling required to meet the standard deviations limit of 0.05 and fit the 90/10 confidence/precision level under a standard t-distribution. If the requirement is not met, more samples will be taken to achieve this. The simple random sampling approach described below is applied to identify the specific ICS to be tested for the respective monitoring period. Note that samples will be taken entirely from the first batch of an ICS type, and the corresponding efficiency values obtained for each ICS vintage will be applied for all subsequent project ICS distributed of that type. The remainder of this subsection will focus on sampling methods to determine the first two parameters in Table 9.

Sampling is conducted separately and independently for each project activity instance under the grouped project for the first two parameters in Table 9, to improve data reliability and accuracy. The sampling frame is taken as the set of all information recorded in the online database for a project instance.

As per CDM standards[21], a 90/10 confidence/precision is to be used for all small-scale projects and 95/10 for all large-scale projects, and in line with methodology AMS-II G[12] a 90/10 confidence/precision when undertaking annual sampling and 95/10 when adopting biennial sampling inspections. We apply a minimum 95/10 confidence/precision when sampling the parameters for monitoring purposes.

[20] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf
[21] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20210531160756223/Meth_Stan05.pdf

Table 9. Parameters which are monitored through the project lifecycle

Parameter	Type
$N_{y,i,j}$ Number of project devices of type i in instance j operating during year y	Proportion
u_y Stove usage adjustment factor accounting for any use of pre-project or other stoves during year y	Proportion
$\eta_{new,y,i}$ Thermal efficiency of ICS of type i in year y	Mean Value

There is no necessity to account for different ICS vintages when sampling, given distribution for a single project instance is unlikely to continue to occur over many years. It should also be noted that geographical variations have minimal influence on the monitored parameters within an instance. Therefore owing to the homogenous nature of an instance population, a Simple Random Sampling technique is used for sampling.

Note that if for any reason a new ICS model or variation on the existing ICS model is included into the project in the future, it will be grouped into a separate population unit and the sampling approach described in this section will be applied to it.

To undertake a Simple Random Sampling approach, a random number generator must be utilised. Given each ICS has a unique serial code identifier, we can first pair each ICS with a sample number. For instance, the samples can begin from 1 and increase up to the total population size of the instance corresponding to all successfully distributed ICS. The random number generator can then be applied to randomly select an ICS from the population. The task is repeated until the targeted sample size is achieved.

Once all ICS in the sample have been identified and mapped, the first two monitored parameters in Table 9 are determined through field surveys conducted by the team. More specifically, for each of the parameters:

$N_{y,i,j}$ A site visit is carried out to inspect the household and identify whether the ICS is in operation. A detailed survey is also conducted with the end user to identify current usage patterns and operation/performance over the past year.

u_y	A site visit is carried out to inspect the household and identify whether any pre-project/other stoves are in operation. A detailed survey is also conducted with the end user to check whether their traditional stove was removed/demolished and if it or any other stove has been used.

In addition to covering these monitored parameters, monitoring surveys provide a wider and more comprehensive review of recent ICS usage, performance and perceptions by end users.

5.3.1.1 Sample size

To determine the sample size for the first two parameters in Table 9 required to represent the instance population, we consider both Simple Random Sampling described earlier and a simplified approach proposed in option (b) under section 8.4 of the methodology.

For the simplified approach a confidence/precision level which is typical of sampling methods does not need to be met. Instead, the approach simply proposes a

(i) minimum sample size 30 for a project target population < 300
(ii) minimum sample size 10% of group size for a project target population 300 - 1000
(iii) minimum sample size 100 for a project target population > 1000

The alternative Simple Random Sampling method can be formulated as

$$n \geq \frac{1.96^2 Np(1-p)}{0.1^2 p^2 (N-1) + 1.96^2 p(1-p)}$$ **Equation 7**

where

n	=	Sample size
N	=	Population size (total number of households or ICS in instance)
p	=	Expected proportion for the sampled parameter
1.96	=	Confidence level (equivalent to 95%)
0.1	=	Relative precision level

The 95% confidence level is used with a precision or margin of error in the estimate that is not more than ±10% in relative terms to the value of the proportion parameter. For this method, the proportion p corresponding to the expected value of the sampled parameter must be estimated. As per CDM guidelines[22], it can be estimated either by

(i) referring to the results of previous studies and using these results
(ii) in a situation where information from previous studies is not available, taking a preliminary sample as a pilot and using that sample to provide the estimates, or
(iii) using best guesses based on the researcher's own experiences

For registration purposes option (iii) will be used. Thus we select a value of $p = 0.8$, which is conservative for the first two monitored parameters in Table 9 as the Project Proponent is

[22] https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

continuously repairing/replacing all ICS and all traditional cookstoves are aimed to be demolished/removed. Note that for the parameter u_y, the expected proportion p here in the sample size calculation corresponds to the proportion of traditional (or other) stoves that are *not* being used (i.e. a failure rate[22]). For subsequent monitoring periods, option (i) above could alternatively be followed to estimate p by using a value determined from the previous monitoring period.

Both the simplified approach and the Simple Random Sampling approach outlined will be applied for sampling each of the parameters $N_{y,i,j}$ and u_y, and the value corresponding to the larger output for each parameter will be carried forward. Once the sample size is obtained for each parameter, the greater value is selected in order to be able to combine monitoring for each period into a single survey. Conducting a single survey allows for optimisation from a time and cost perspective and is a more conservative approach.

In the following we present an example application of the sample sizing approach described above.

Taking the case of the first project activity instance where the ICS is distributed in the ASR district of Andhra Pradesh, it is estimated that the total number of beneficiary households (population N) will around 50,000. In addition, a value of $p = 0.8$ for u_y and $p = 0.75$ for $N_{y,i,j}$ is taken for illustrative purposes.

Applying Equation 7 denoting Simple Random Sampling, first for parameter u_y, we calculate the sample size for a 95/10 confidence level/precision as

$$n \geq \frac{1.96^2 \times 50{,}000 \times 0.8(1-0.8)}{0.1^2 \times 0.8^2 \times (50{,}000-1) + 1.96^2 \times 0.8(1-0.8)}$$

$$n \geq 95.86$$

$$n = 96$$

This output is lower than the 100 corresponding to option (iii) under the simplified approach above. As a result, a sample size of 100 would be considered the minimum size threshold for u_y.

Similarly, applying the formulation for parameter $N_{y,i,j}$, we obtain

$$n \geq \frac{1.96^2 \times 50{,}000 \times 0.75(1-0.75)}{0.1^2 \times 0.75^2 \times (50{,}000-1) + 1.96^2 \times 0.75(1-0.75)}$$

$$n \geq 127.73$$

$$n = 128$$

This output is greater than the 100 corresponding to option (iii) under the simplified approach above. Therefore, a sample size of 128 would be considered the minimum size threshold for $N_{y,i,j}$.

To be able to combine both u_y and $N_{y,i,j}$ into a single monitoring survey as planned, one then takes the larger of the two outputs above, represented by 128, as the minimum size threshold for sampling over the respective monitoring period.

5.3.2 Implementation plan & Data quality control

The Project Proponent will oversee and manage the monitoring process and sampling plan to ensure accurate measurement and reporting of emissions reductions from the project activity throughout the project life. The methods set out in Table 10 are applied for the purposes of monitoring the parameters from Table 9, and this is undertaken with representative sampling as outlined in section 5.3.1 to identify the specific households to be included in the respective monitoring cycle.

Table 10. Frequency and methods with which project parameters are monitored

Parameter	Monitoring frequency	Frequency as required by methodology	Monitoring methods to be applied	Seasonal fluctuation
$N_{y,i,j}$	Expected every 6 months and will occur at least biennially	Biennial	Site visits to undertake visual examination and conducting detailed survey/interview	None
u_y	Expected every 6 months and will occur at least biennially	Biennial	Site visits to undertake visual examination and conducting detailed survey/interview	None
$\eta_{new,y,i}$	Expected annually	Annual	WBTs conducted by independent technical laboratories	None

Substantial oversampling is applied for the first two parameters in Table 10 in order to enhance the reliability of the data recorded, as well as to adjust for any errors or cases of answer bias that may be observed. Note that outliers do not exist for these monitoring parameters as they correspond to proportions as opposed to mean values under the methodology.

To successfully implement the project, an extensive training programme is conducted prior to distribution for each instance for all local field staff and coordinators employed for the purposes of data collection. This includes classroom lectures (as shown in Figure 16) outlining survey structure, purpose and goals, demonstrations of the Tramontana ICS software application (see Figure 5), as well as on-field practice sessions to gain experience in using the tablets containing the application. A key additional aspect of the training programme is to convey engagement techniques with the community, approaches to minimising errors, and methods to deal with issues faced such as non-response cases, conflicts of interest and interviewer bias. Members of the local community are typically employed as field staff in order to maintain closer community engagement and maximise response rate, whilst it also provides support to the local people in the form of employment and training. All field staff within a mandal are accompanied by an experienced mandal coordinator who helps oversee distribution, ensuring the team work in an efficient manner and to help tackle any problems faced.

Figure 16. An internal classroom training session held for field team members in advance of ICS distribution

All surveys used for the project have been designed and tested by the Project Proponent in consultation with the various stakeholders. The surveys have been programmed into the Tramontana ICS software application which is used by the field teams. The team are able to view the application on tablets, which have been purchased specifically for the purposes of the project activity. The application has been developed to work in an offline mode given the remoteness of project households/beneficiaries. Once a field team member has successfully completed a survey (after meeting all requirements and passing the built-in checks in the application), they can submit the entry on the tablet to create a record for the respective beneficiary. The built-in checks in the application such as mandatory fields/data types minimise any incorrect or incomplete surveys from being submitted. The submitted record is stored locally and will be automatically synced to a Google cloud database once the tablet is brought online under an internet connection. This automation of syncing maintains the data integrity and minimises any risk of data loss, theft, tampering/fraud or negligence/errors in translation. Once the data is in the cloud database, it is automatically processed and translated into an Excel sheet format which can be easily analysed by the VVB, Verra and any other project parties.

Once distribution/monitoring data has been recorded, submitted and translated into the Excel sheet, it is checked by a dedicated local office team for the purposes of quality control against a pre-defined set of criteria developed by the Project Proponent. The team's tasks include checking all: written responses, photos (including their content, clarity and positioning), signed licence agreements and location coordinates. Any deviation from the set of criteria will be marked, rejected and sent immediately for resurveys in the field. Incorrect surveys are later removed from the database once the resurveys have been successfully completed. Multiple tiers of checking are undertaken by the office staff as part of the quality control process, initially with the junior members and then office managers at the final stage to ensure all incorrect entries are identified.

Note that at the initial stage after ICS distribution some additional checks are also carried out. This includes a physical household visit to all ICS beneficiaries in the weeks following distribution, to ensure the ICS is being used correctly, to provide helpful tips (e.g. optimal processing methods for the firewood) and to obtain feedback on the ICS performance to date. Simultaneously, a separate dedicated team focusses on calling and checking all phone numbers in the database that were provided by households during distribution, to ensure beneficiaries are reachable if needed at any time by the Project Proponent.

Any ICS that is found not to be in use post-distribution or from a monitoring survey will not be counted towards the total number of ICS in operation for the preceding period or thereafter. Further, any use of alternative stoves, for instance which may have been built or purchased since the distribution of the project ICS, will be accounted for using the method described in the table in section 5.2 for the monitored parameter u_y.

The final data available in the online database will include (i) initial information obtained during ICS distribution (outlined in section 1.11.1) and (ii) monitoring data recorded from sample monitoring surveys (and laboratory tests) as outlined in section 5.2. The data will be extensive and directly attributable to a particular ICS/household, forming clear evidence for any emissions reductions that are claimed.

For the purposes of monitoring, the Project Proponent will compile a regular monitoring report to be submitted to the VVB as part of project audits throughout the project life. This will detail the monitoring activity and monitoring data recorded in the online project database and from laboratory tests, as well as the associated calculations specifying the emissions reductions from the project activity for the respective period.

APPENDIX 1

The schedule followed including the event details for stakeholder meetings conducted for the first project instance in Andhra Pradesh is outlined.

<table>
<tr><th>Mandal</th><th>Village</th><th>Meeting Venue</th><th>Attendees</th><th>Date</th><th>Special Guests</th></tr>
<tr><td rowspan="3">Paderu</td><td>Modapalli</td><td>AMC Yard</td><td>105</td><td>14-Nov-2022</td><td>Kottagulli Usha Rani (President (Sarpanch) of GP Paderu)
Sonari Ratnakumari (Mandal Parishad President of Paderu)
Sonari Venkata Ramana Murthy (ex-Mandal Parishad President of Paderu)</td></tr>
<tr><td>Onuru</td><td>Anganwadi Centre</td><td>52</td><td>15-Nov-2022</td><td>Thokala Eswara Rao (MPTC of Vantalamamidi)
Pangi Rambabu (President of Vantalamamidi)
Palliki Lakku (CFFI National Member)</td></tr>
<tr><td>Paderu</td><td>Sri Modhakonda mmathalli Temple</td><td>310</td><td>28-Dec-2022</td><td>Sri V. Abhishek (Sub Collector of A.S.R. district)
Sri Shathakabulli Babu (Tricor Chairman of Paderu)
Kotagulli Usharani (President of Paderu)
Rathnakumari (MPP of Paderu)
Sri Ramana Murthy (Former MPP of Paderu)</td></tr>
<tr><td>G. Madugula</td><td>Gaduthuru</td><td>Anganwadi</td><td>137</td><td>16-Nov-2022</td><td>Kondapalli Simhachalam (President of Gaduthuru)
Madhusudhan Babu (Secretary of Gaduthuru GP)</td></tr>
</table>

					K. Chandrapathi (President of PESA (Panchayaths Extension to Scheduled Area) of Gaduthuru)
	G. Madugula	Rachabanda	108	17-Nov-2022	Mathyarasa Gayathri Devi (Market Yard Chairman of G. Madugula and Paderu mandals) Kimudu Rambabu (President of G. Madugula) Mathyasara Vijaya Kumari (MPTC Member of G. Madugula) Pangi Chitti Babu (MPTC of G. Madugula)
Hukumpeta	Dabavalasa	Jio Tower	79	20-Nov-2022	Korra Raja Rao (Former MPTC of Hukumpeta) Kincheyi Krishna (President of Dabavalasa)
Pedabayalu	Galaganda	Panchayath Office	82	19-Nov-2022	Pujari Lohidasu (President of Galaganda) Thalla Bullamma (Former President of Galaganda) Marri Devayya (Former President of Pedakodapalli)
	Pedabayalu	Girijana Bhavan	63	21-Nov-2022	Korra Raju Babu (Vice MPP of Pedabayalu) Vanthala Ananda Rao (MPTC of Pedabayalu) Gullili Krishna Rao (President of Pedabayalu)
Chinthapalli	Gondhipakalu	Grama Sachivalayam	102	22-Nov-2022	Thambeli Mohan Rao (MPTC of Chinthapalli) Sagila Varalaxmi (President of Gondhipakalu)

	Yerrabandha	GCC Godowns	103	24-Nov-2022	Segge Sathibabu (MPTC of Chinthapalli) Lotha Pandayya (President of Pedhuru) Kuda Chinnabbai (Former President of Pedhuru) Kuda Raju Babu (VRP NREGS of Pedhuru)
G.K. Veedhi	Devarapalli	Grama Sachivalayam	118	23-Nov-2022	Pothuraju Krishna Murthy (MPTC of Devarapalli) Siribala Bujji Babu (President of Devarapalli) Matchala Mathya Raju (Former ZPTC of Devarapalli)
	Kothapalem	MPP School	102	25-Nov-2022	Motanam Sathyanarayana (MPTC of G.K. Veedhi) Kankipati Veerendra Prasad (President of Kothapalem village) Kankipati Ramarao (Former MPTC of G.K Veedhi)
Araku Valley	Baski	Volleyball Ground	107	26-Nov-2022	Ranjapalli Usharani (MPP of Araku Valley) Padi Ramesh (President of Baski) Killo Ramanna (Vice MPP of Baski)
	Nandi Valasa	MPP School Building	84	28-Nov-2022	Swabi Ramachandra (MPTC of Madhala) J. Kiran Kumar (Panchayath Secretary of Madhala village)
Ananthagiri	Venaganda	MPP School Building	53	27-Nov-2022	Sembi Sanyasi Rao (President of Vaalasi)

					Sodipalli Seema (President of Venaganda) Siveri Kondala Rao (Former President of Venaganda)
Munchingiputtu	Munchingiputtu	Community Hall	161	30-Nov-2022	Jallipalli Subhadra (Z.P chairperson of Munchingiputtu) P.Sathyanarayana (MPP of Munchingiputtu) K.Kiran Kumar (MPDO of Munchingiputtu) Seesa Subhash (President of Kinchayiputtu)
	Maddulabanda	MP Primary School	65	02-Dec-2022	K. Muktamma (President of Kamada GP) K. Radhakrishna (G.P.S School Teacher in Kamada GP)
Dumbriguda	Dumbriguda	IKP Office	197	01-Dec-2022	V. Nagesh (MPDO of Dumbriguda) M. Geetha (MPTC of Dumbriguda)
	Parasilla	Rachhabanda	71	03-Dec-2022	Shobha Raghupathi (MPTC of Parasilla) Veeraboyina Subbarao (President of Parasilla)
Koyyuru	Yerri Naidu Pakalu	Near Community Hall	60	03-Dec-2022	Badugu Ramesh Babu (MPP of Koyyuru) Jampa Rajakumari (President of Koyyuru)
	Palakajeedi	Government School Building	60	04-Dec-2022	B. Ramesh Babu (MPP of Koyyuru) Dadala Ramesh (President of Palakajeedi)

					Thammarbha Madhava Rao (MPTC of Palakajeedi)

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APPENDIX 2

Laboratory water boiling test (WBT) results on the Tramontana ICS (detailed in Table 2 and Table 3) conducted by the Department of Mechanical Engineering at Jorhat Engineering College

Thermodynamic Laboratory

Department of Mechanical Engineering

Jorhat Engineering College

Jorhat-7, Assam

www. jecassam.ac.in/

1. Water Boiling test results of FUELNZEL (CRS-23) stove

Fuelnzel (CRS-23), a natural draft biomass cook stove was tested in the Thermodynamic Laboratory of the department of Mechanical Engineering, Jorhat Engineering College, Jorhat. The stove was tested according to the water boiling test protocol WBT 4.2.3. The details of the stove and the test results are given below.

1.1 Details of FUELNZEL (CRS-23) Stove

Specification

Fuel Type	Wood
Feeding Type	Front Feeding
Combustion chamber	Ceramic
Cooking suitable for	5 to 10 persons
Net wet	11 kg
Draft	Natural draft

Manufactured by

Ravi Engineering and Chemical Works
ADD:L-166, Sector-3
DSIIDC BAWANA, DELHI 110039
Email: recwfire@gmail.com

1.2 Test results

The average thermal efficiency of the stove was found to be 36%. The summary of the test results is given in the table below.

1. HIGH POWER TEST (COLD START)	units	Test 1	Test 2	Test 3	Average
Time to boil	min	39	37	37	37.7
Temp-corrected time to boil	min	38	36	36	37
Burning rate	g/min	9	10	10	10
Thermal efficiency	%	35%	35%	35%	35.1%
Specific fuel consumption	g/liter	77	77	75	76
Temp-corrected specific consumption	g/liter	74	75	74	74

1

Temp-corrected specific energy cons.	kJ/liter	1 ,318	1,330	1,315	1,321
Firepower	watts	2,752	2,899	2,844	2,831
2. HIGH POWER TEST (HOT START)	**units**	**Test 1**	**Test 2**	**Test 3**	**Average**
Time to boil Pot	min	34	37	36	35.7
Temp-corrected time to boil	min	33	36	36	35
Burning rate	g/min	11	9	9	10
Thermal efficiency	%	37.3%	36.9%	37%	37%
Specific fuel consumption	g/liter	77	73	71	73
Temp-corrected specific consumption	g/liter	75	71	71	72
Temp-corrected specific energy cons.	kJ/liter	,332	1,260	1,254	1282
Firepower	watts	3,118	2,743	2,770	2,877
3. LOW POWER (SIMMER)	**units**	**Test 1**	**Test 2**	**Test 3**	**Average**
BENCHMARK VALUES (for 5L)		**Test 1**	**Test 2**	**Test 3**	**Average**
Fuel Use Benchmark Value	g	373	364	361	366
Energy Use Benchmark Value	kJ	6,625	6,475	6,421	6,507
IWA PERFORMANCE METRICS	**units**	**Test 1**	**Test 2**	**Test 3**	**Average**
High Power Thermal Efficiency	%	36.4%	35.8%	36.0%	36.01%

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