



# DISTRIBUTION OF IMPROVED COOK STOVE - PHASE 18



Document Prepared By EKI Energy Services Limited

Contact Information: Office No. 201, EnKing Embassy Plot No. 48, Scheme No. 78  
Part II, Vijay Nagar Indore – 452001

|                      |                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Project Title</b> | Distribution of Improved cook stove - Phase 18                                                                                                                                                                                                                                                                                                                           |
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| <b>Prepared By</b>   | Mr. Pankaj Rajpoot                                                                                                                                                                                                                                                                                                                                                       |
| <b>Contact</b>       | Assistant Manager Operations – GHG Services<br>EKI Energy Services Limited<br>Email ID : <a href="mailto:registry@enkingint.org">registry@enkingint.org</a><br>T +91 731 42 89 086, M +91 7828347589<br>Address: Office no. 201, Plot 48, Scheme 78 part 2, Vijay Nagar<br>Indore - 452010 (M.P, India) Website <a href="http://www.enkingint.org">www.enkingint.org</a> |

# CONTENTS

|          |                                                                       |           |
|----------|-----------------------------------------------------------------------|-----------|
| <b>1</b> | <b>PROJECT DETAILS.....</b>                                           | <b>3</b>  |
| 1.1      | Summary Description of the Project .....                              | 3         |
| 1.2      | Sectoral Scope and Project Type .....                                 | 5         |
| 1.3      | Project Eligibility .....                                             | 5         |
| 1.4      | Project Design .....                                                  | 5         |
| 1.5      | Project Proponent .....                                               | 6         |
| 1.6      | Other Entities Involved in the Project .....                          | 6         |
| 1.7      | Ownership.....                                                        | 6         |
| 1.8      | Project Start Date .....                                              | 7         |
| 1.9      | Project Crediting Period .....                                        | 7         |
| 1.10     | Project Scale and Estimated GHG Emission Reductions or Removals ..... | 7         |
| 1.11     | Description of the Project Activity .....                             | 8         |
| 1.12     | Project Location .....                                                | 11        |
| 1.13     | Conditions Prior to Project Initiation .....                          | 20        |
| 1.14     | Compliance with Laws, Statutes and Other Regulatory Frameworks .....  | 28        |
| 1.15     | Participation under Other GHG Programs .....                          | 28        |
| 1.16     | Other Forms of Credit.....                                            | 29        |
| 1.17     | Additional Information Relevant to the Project .....                  | 29        |
| <b>2</b> | <b>SAFEGUARDS .....</b>                                               | <b>30</b> |
| 2.1      | No Net Harm .....                                                     | 30        |
| 2.2      | Local Stakeholder Consultation .....                                  | 30        |
| 2.3      | Environmental Impact .....                                            | 31        |
| 2.4      | Public Comments .....                                                 | 31        |
| 2.5      | AFOLU-Specific Safeguards .....                                       | 31        |
| <b>3</b> | <b>APPLICATION OF METHODOLOGY.....</b>                                | <b>31</b> |
| 3.1      | Title and Reference of Methodology .....                              | 31        |
| 3.2      | Applicability of Methodology .....                                    | 31        |
| 3.3      | Project Boundary .....                                                | 34        |
| 3.4      | Baseline Scenario .....                                               | 35        |
| 3.5      | Additionality .....                                                   | 35        |
| 3.6      | Methodology Deviations .....                                          | 36        |
| <b>4</b> | <b>QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS .....</b>   | <b>36</b> |
| 4.1      | Baseline Emissions .....                                              | 36        |
| 4.2      | Project Emissions .....                                               | 36        |
| 4.3      | Leakage.....                                                          | 36        |
| 4.4      | Net GHG Emission Reductions and Removals .....                        | 36        |
| <b>5</b> | <b>MONITORING .....</b>                                               | <b>37</b> |
| 5.1      | Data and Parameters Available at Validation .....                     | 37        |
| 5.2      | Data and Parameters Monitored.....                                    | 37        |
| 5.3      | Monitoring Plan.....                                                  | 38        |
|          | <b>APPENDIX.....</b>                                                  | <b>39</b> |

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

Purpose of the project activity is to facilitate clean cooking practices and reduce health risk due to indoor air pollution<sup>1</sup> along with household drudgery amongst the tribal households (ST) and families living Below the Poverty Level (BPL category<sup>2</sup>) in villages of Maharashtra through dissemination of improved cook stoves. The improved cook stoves through replacement of inefficient traditional cook stove will contribute towards reduction of Green House Gases emission and by-products of incomplete combustion like black carbon, conservation of fuel wood and prevent forest degradation. Successful operation of the project activity will encourage rural residents to shift from traditional cook stoves usage to the project improved and modern cook stove. The improved cook stoves distributed are more efficient with thermal efficiency of 29.88%<sup>3</sup> compared to traditional stoves with thermal efficiency of around 10%<sup>4</sup>. Use of efficient cook stove will result in fuel consumption reduction i.e. non-renewable biomass (since the demand of fire wood is considerably higher than the sustainable potential of fire wood extraction and there the wood available through unsustainable extraction is conceived as non-renewable biomass) through minimizing of thermal energy losses by facilitating complete combustion and thereby resulting in GHG emission reduction.

### **Baseline Scenario:**

The higher efficiency portable, single pot cook stoves distributed and conceived under the project activity has replaced prevailing practice of using traditional cook stoves in rural areas across the state (research study reveals that out of 120 million of the total potential of biomass cook stove in India<sup>5</sup>, total number of cook stoves being distributed is around 14.904 million (WHO, UNDP 2009). Separate study report by ESMAP revealed that, improved cook stoves accounted for less than 7 percent of the total biomass stoves used in rural areas. The report also refers to the latest national survey in India which indicates only 5 percent of rural households possess an improved stove (Zhang et al. 2006). The study also highlights over the fact that Maharashtra is one of those few states where, improved cook stoves were distributed under the National Programme of Improved Chulha (NPIC) since 1983-84. The distribution of cook stoves also continued after the end of NPIC programme. The distribution was facilitated through Rural Development and Water Conservation (RDWC) Department,

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

<sup>2</sup> <sup>2</sup> As per the article in The Hindu dated March 20, 2012 anyone with daily consumption expenditure below Rs. 22.42 is categorised under BPL. The article depicts of 24.5% of the total population in Maharashtra under BPL in 2009-10. The article depicts that Scheduled Tribes (47.4%) suffers the highest level of poverty across the country

<sup>3</sup> Thermal Efficiency Test Report of Improved Cook stove tested at Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur

<sup>4</sup> Paragraph 6 (Option 2) of approved applicable methodology AMS –II.G., Version 04

Maharashtra Energy Development Agency and Khadi and Village Industries Commission. Even after prolonged period of distribution, around 85% of households in the villages of Maharashtra still rely on traditional cook stoves.

| MPCE Groups     | Percentage of Population using firewood |
|-----------------|-----------------------------------------|
| Rs. 0 – 235/-   | 79.2%                                   |
| Rs. 235 – 270/- | 93.8%                                   |
| Rs. 270 – 320/- | 90.0%                                   |
| Rs. 320 – 365/- | 87.2%                                   |
| Rs. 365 – 410/- | 86.2%                                   |
| Rs. 410 – 455/- | 84.2%                                   |
| Rs. 455 - 510/- | 82.8%                                   |

### Technology Employed

The cook stove deployed under the project activity is single pot, portable, metallic, improved biomass cook stoves made of cast iron for combustion of solid biomass. The improved cook stoves are manufactured in accordance to IS 13152, Part-1: 1991, CPRI Design Type I<sup>5</sup> standard. The design ensures complete combustion of biomass. The cook stove is tested for thermal efficiency of 29.88% as per water boiling test protocol specified in IS 13152, Part 1: 1991.

The project activity plans to disseminate the improved cook stoves over period of time amongst BPL (Below Poverty Line) and Scheduled Tribes (ST) households in rural areas of Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts which lies in Aurangabad, Amravati and Nagpur Divisions of Maharashtra. The project is to consider beneficiaries comprising of 14,400 Nos. of households to whom improved cook stoves are to be disseminated under the programme and has signed the end user Tripartite Agreement. The project through conservation of non-renewable biomass will result in annual average greenhouse gas emission reduction of 12,945 tCO<sub>2</sub>e and total GHG emission reductions over the ten years fixed crediting period is 129,450 tCO<sub>2</sub>e.

Vikram Stoves and Fabricators (hereafter referred to as Vikram Stoves) is a MNRE (Ministry of New and Renewable Energy) approved manufacturer and distributor of improved cook stoves having operation network in Maharashtra. The agency is selected by the RDWC Department, Government of Maharashtra for distribution of improved cook stoves amongst identified beneficiaries. With an objective of wide spread dissemination (under limited annual budgetary support provision of the Ministry) of improved cook stoves and facilitate continual usage at beneficiary level; the manufacturer conceived VCS in its revenue model. The

<sup>5</sup> The design of the cook stove is certified by Bureau of Indian Standards relating to its appropriateness to, IS 13152 (Part1). The standard was adopted by Bureau of Indian Standard after the draft finalized by the oil burning Appliances Sectional Committee had been approved by Heavy Mechanical Engineering Division Council.

revenue was considered in deciding upon the capital cost as well as to meet up the cost towards imparting awareness and training, periodic maintenance<sup>6</sup> and post lifetime replacement within the crediting period.

M/s. G K Energy Marketers Pvt Ltd (hereafter referred to as GKEMPL) is authorised as Project Participant by Vikram Stoves and the end users for development of VCS project activity for the cook stove dissemination. As a part of the project activity GKEMPL (Project Participant) along with Vikram Stoves will enter into contractual agreement with each beneficiaries by virtue of which the end user will confirm use of cook stove as well as transfer the CER right to the Project Participant.

## 1.2 Sectoral Scope and Project Type

**The project activity falls under Sectoral Scope 3: Energy Demand**

This project is not grouped project because there is no addition other project activity.

This is non-AFLOU type of project.

## 1.3 Project Eligibility

The project activity involves replacement of the traditional cook stoves by improved cook stoves. The improved cook stoves owing to its higher combustion efficiency of 29.88% in comparison to 10% efficiency of the traditional cook stoves results in efficiency improvement and same do not exceed equivalent of 20 Giga watt hour (GWh) (60 giga watt hour thermal (GWhth)) per year. As the cumulative energy saving from the project activity is less than 20 GWh/annum or 60 GWhth/annum and each of the independent sub-systems i.e. Improved cook stoves used in household only for the purpose of cooking results an estimated annual energy savings of 4.073 MWhth or 1.358 MWh which is well smaller than permissible limit of 600 MWh. Hence the project activity is eligible Sectoral scope 3 i.e. energy demand under the scope of the VCS Program. This project activity is registered under CDM mechanism with a fixed crediting period of 10 years and has been chosen for this project activity in VCS.

## 1.4 Project Design

The project activity plans to disseminate the improved cook stoves over period of time amongst BPL (Below Poverty Line) and Scheduled Tribes (ST) households in rural areas of Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola,

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<sup>6</sup> "The Indian stove programme: an insider's view –the role of society, politics, economics and education" by Bhaskar Sinha, National Institute of Science, Technology & Development Studies (NISTADS), CSIR, New Delhi outlines that the woman are least interested for maintenance as they do not perceive the usefulness of the stove and revert back to traditional practice when the cook stove becomes non-functional therefore timely operation and maintenance are vital.

Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia districts which lies in Aurangabad, Amravati and Nagpur Divisions of Maharashtra. The project is to consider beneficiaries comprising of 14,400 Nos. of households to whom improved cook stoves are to be disseminated under the programme and has signed the end user Tripartite Agreement. The project through conservation of non-renewable biomass will result in annual average greenhouse gas emission reduction of 12,945 tCO<sub>2</sub>e and total GHG emission reductions over the ten years fixed crediting period is 129,450 tCO<sub>2</sub>e.

### Eligibility Criteria

Not applicable to this project activity as this is not a grouped project.

## 1.5 Project Proponent

|                          |                                                                         |
|--------------------------|-------------------------------------------------------------------------|
| <b>Organization name</b> | M/s. G K Energy Marketers Pvt Ltd                                       |
| <b>Contact person</b>    | Mr. Gopal Kabra                                                         |
| <b>Title</b>             | Managing Director                                                       |
| <b>Address</b>           | Flat No.- 350, Building No.- 25, Ground Floor, Pune, Maharashtra, India |
| <b>Telephone</b>         | + 91 20 2432 1115                                                       |
| <b>Email</b>             | <a href="mailto:gopal@energymarketers.in">gopal@energymarketers.in</a>  |

## 1.6 Other Entities Involved in the Project

|                            |                                                                                  |
|----------------------------|----------------------------------------------------------------------------------|
| <b>Organization name</b>   | EKI Energy Services Limited                                                      |
| <b>Role in the project</b> | Project Consultant                                                               |
| <b>Contact person</b>      | Mr. Pankaj Rajpoot                                                               |
| <b>Title</b>               | Assistant Manager- Operations                                                    |
| <b>Address</b>             | Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India |
| <b>Telephone</b>           | +91- 7828347589                                                                  |
| <b>Email</b>               | <a href="mailto:registry@enkingint.org">registry@enkingint.org</a>               |

## 1.7 Ownership

As per VCS Program Definitions version 4.2 the project ownership is the legal right to control and operate the project activities. As per CDM Project Design Document section A.1, M/s. G K Energy Marketers Pvt Ltd (hereafter referred to as GKEMPL) is authorized as Project Participant by Vikram Stoves and the end users for development of VCS project activity for securing carbon financing for the cook stove dissemination. As a part of the project activity GKEMPL (Project Participant) along with Vikram Stoves has entered into contractual agreement with each beneficiaries by virtue of which the end user has confirmed use of cook stove as well as transfer the CER right to the Project Participant Based on above evidences,

the project ownership is demonstrated and M/s. G K Energy Marketers Pvt Ltd is authorized project owner.

## 1.8 Project Start Date

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

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

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

## 1.9 Project Crediting Period

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

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

The length of the first crediting period is 06-10-2012 to 05-10-2022 (both dates inclusive).

## 1.10 Project Scale and Estimated GHG Emission Reductions or Removals

| Project Scale |   |
|---------------|---|
| Project       | √ |
| Large project |   |

| Year                                   | Estimated GHG emission reductions or removals (tCO <sub>2</sub> e) |
|----------------------------------------|--------------------------------------------------------------------|
| Year 1 (06-10-2012 -05-10-2013)        | 12,945                                                             |
| Year 2 (06-10-2013 -05-10-2014)        | 12,945                                                             |
| Year 3 (06-10-2014 -05-10-2015)        | 12,945                                                             |
| Year 4 (06-10-2015 -05-10-2016)        | 12,945                                                             |
| Year 5 (06-10-2016 -05-10-2017)        | 12,945                                                             |
| Year 6 (06-10-2017 -05-10-2018)        | 12,945                                                             |
| Year 7 (06-10-2018 -05-10-2019)        | 12,945                                                             |
| Year 8 (06-10-2019 -05-10-2020)        | 12,945                                                             |
| Year 9 (06-10-2020 -05-10-2021)        | 12,945                                                             |
| Year 10 (06-10-2021 -05-10-2022)       | 12,945                                                             |
| <b>Total estimated ERs</b>             | <b>129450</b>                                                      |
| <b>Total number of crediting years</b> | <b>10</b>                                                          |
| <b>Average annual ERs</b>              | <b>12,945</b>                                                      |

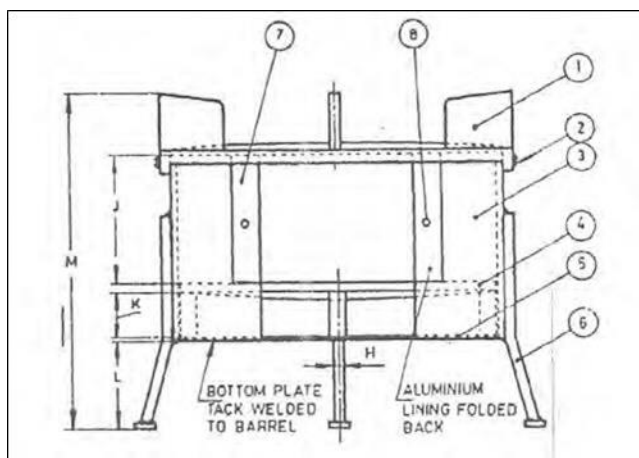
### 1.11 Description of the Project Activity

The improved cook stove conceived under the project activity is MNRE and BIS (Bureau of Indian Standard) approved state of art and environmentally sound technology. The improved cook stove is manufactured in accordance to IS13152 (Part 1): 1991 (Solid Biomass – Chulha Part 1(Metallic))<sup>7</sup>. This Indian Standard was adopted by the Bureau of Indian Standard after the draft finalized by the oil burning Appliances Sectional Committee had been approved by Heavy Mechanical Engineering Division Council and hence there has no transfer of technology for the project activity. The standard has been prepared in line with the national approach towards fuel conservation, better environment, mitigating health

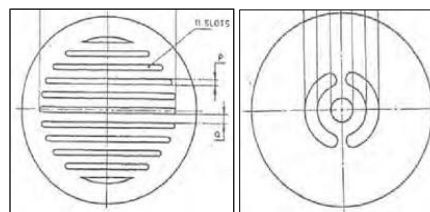
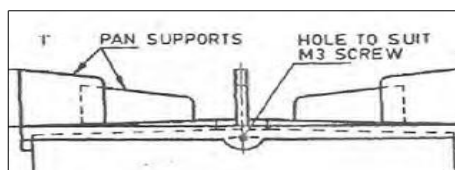
<sup>7</sup> The Standard has been prepared by Indian Standard body in line with the national approach towards fuel conservation and better environment, mitigating health hazards and drudgery and loss of forest cover caused by burning of wood as cooking fuel (Forward: Indian Standard Solid Bio-Mass, Chulha – Specification Part 1 Portable (Metallic))

hazards and loss of forest cover caused by burning of wood as cooking fuel and therefore can be conceived as an environmentally sound technology for combustion of solid biomass for the purpose of cooking. Moreover, the materials used in the manufacturing of the cook stove are of iron and steel which is recyclable after end use and hence considered to be environmentally safe after lifetime also.

The cook stove distributed under the project activity is a portable, single-pot stove without chimney, natural draft and metal made stove specifically suitable for combustion of solid biomass. The cook stove broadly comprises of a combustion chamber, top plate for holding the utensils, grate for holding fuel during combustion and bottom plate that facilitates ventilation of air. The combustion chamber is cylindrical shaped and made up of mild steel. One side of the chamber of improved cook stove is opened for feeding of fuel. The chamber top plate is die cast and made up of cast iron. All the stoves included in the project activity will remain within the project activity and as such no new stoves/ new beneficiaries will be added to the project activity.



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





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

| Component         | Material                  |
|-------------------|---------------------------|
| Top plate         | Cast iron                 |
| Grate             | Cast iron                 |
| Barrel            | Mild steel                |
| Bottom Plate      | Mild steel                |
| Lining            | Aluminum                  |
| Perforated Sleeve | Mild steel                |
| Handle            | Mild steel                |
| Pan Support       | Mild steel sheet-flat-rod |
| Legs              | Mild steel sheet and rod  |

### Measures undertaken

The Rural Development and Water Conservation (RDWC) Department, Government of Maharashtra is involved in promoting betterment of living standard for the tribal household (ST) and families living Below Poverty Line (BPL) in villages of Maharashtra. The department as a part of its aforesaid programme selects households belong to ST and BPL category depending upon level of vulnerability (assessed on basis of 13 parameters: Category and size of usable land, Type of house, Availability of regular usable clothes, Protection of food or food security, Cleanliness, Ownership of required goods, Heights /Level of literacy, Family working capacity, Source of livelihood goods, Number of children in age group (5 to 14), Type of bankruptcy, reason for staying away from family of Earning member, Choice of help /Yojana) 62 and provide financial assistance to facilitate better and hygienic living standard. The household selected for financial assistance under the programme is provided with an improved cook stove system. The household considered as end users of cook stoves under the project activity are poor enough to afford for procurement of cook stoves and are also least interested towards investment as wood is available for free. So, in absence of the cook stove the household would have continued with traditional cooking practice. Since, the project activity is conceived under the program of Govt. of Maharashtra which provides cook stove only to BPL and ST category household so there is no chance the cook stove will be distributed to non-baseline household. Therefore, identification of beneficiaries and

distribution of the cook stoves comes under the preview of the Rural Development and Water Conservation Department.

## 1.12 Project Location

The project is located in state Maharashtra, India.

Division: Aurangabad,

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

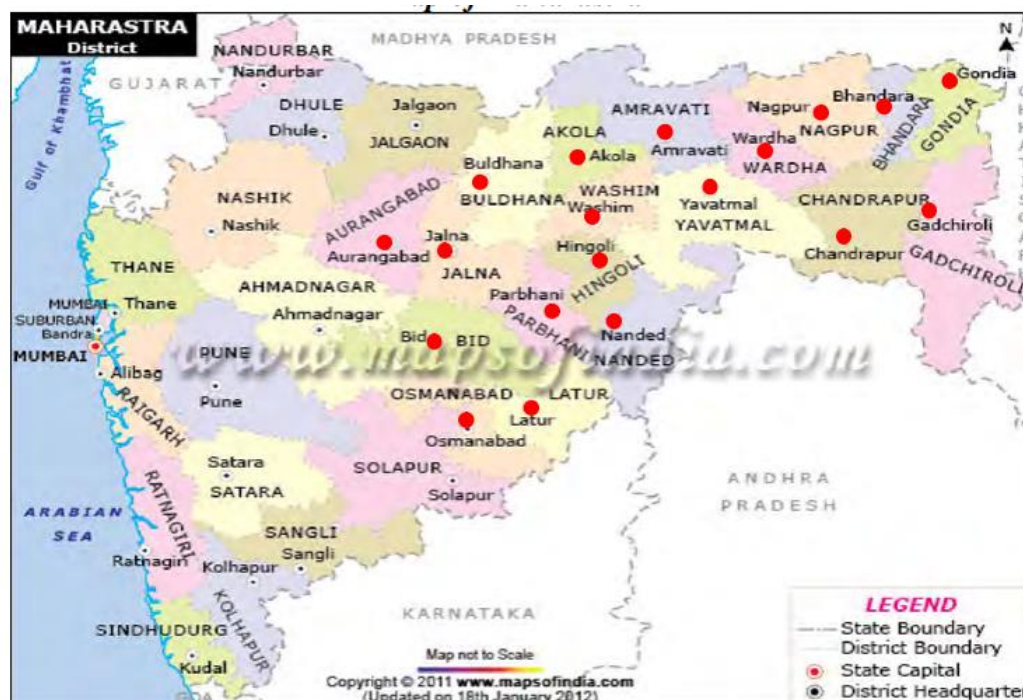
Districts: Buldhana, Akola, Washim, Amravati, Yavatmal, Division: Nagpur

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

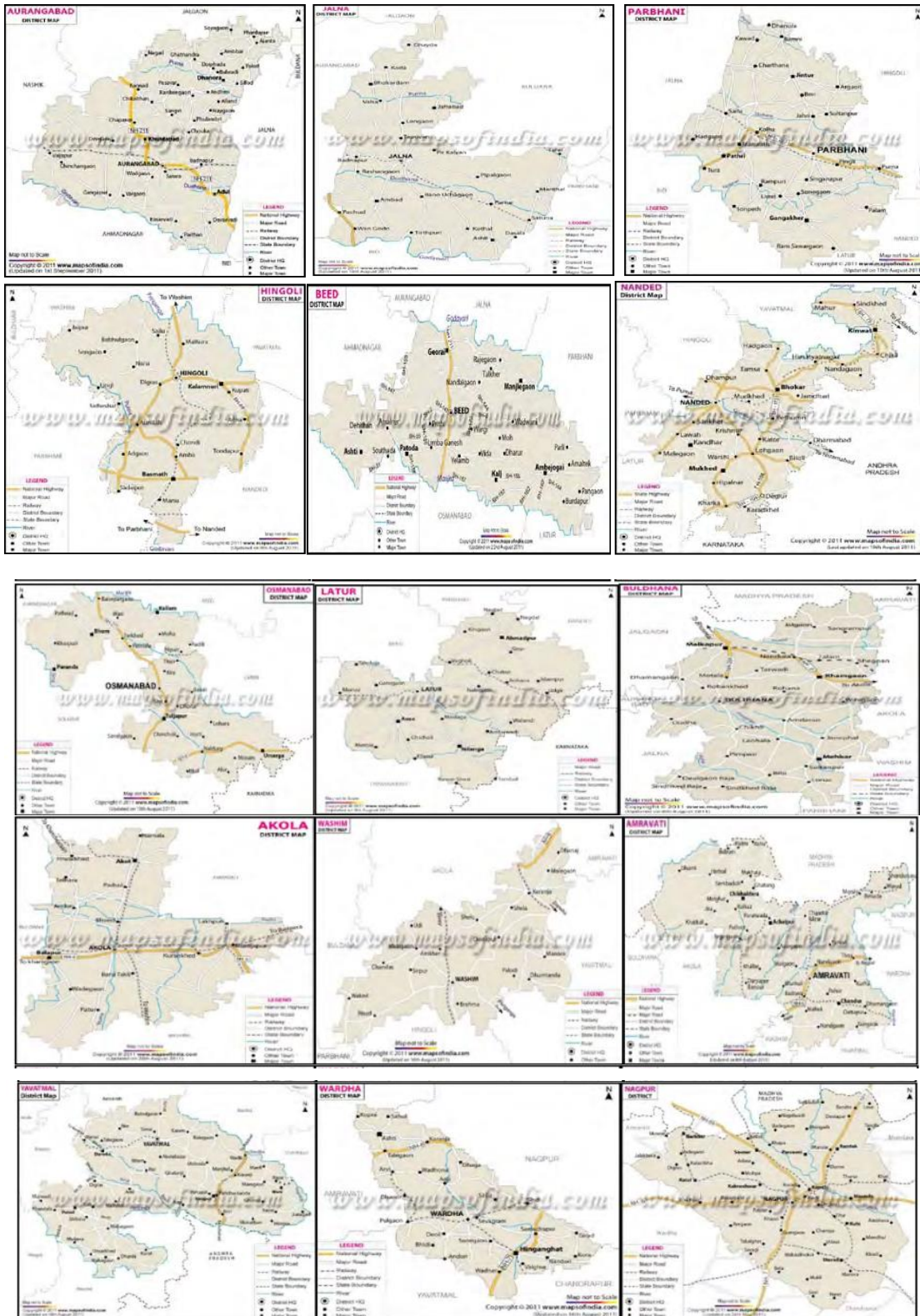
| Division   | District   | Latitude         | Longitude        |
|------------|------------|------------------|------------------|
| Aurangabad | Aurangabad | 19.00 – 20.00 °N | 74.00 – 76.00 °E |
|            | Jalna      | 19.10 - 21.30 °N | 75.40 - 76.40 °E |
|            | Parbhani   | 18.45 - 20.10 °N | 76.13 - 77.39 °E |
|            | Hingoli    | 19.43 °N         | 77.11 °E         |
|            | Beed       | 18.30 - 19.30 °N | 74.50 - 76.60 °E |
|            | Nanded     | 18.25 - 19.91 °N | 77.00 - 78.41 °E |
|            | Osmanabad  | 17.35 - 18.40 °N | 75.16 - 76.40 °E |
|            | Latur      | 17.75 - 18.75 °N | 76.25 - 77.25 °E |
| Amravati   | Buldhana   | 19.85 - 21.28 °N | 75.95 - 76.81 °E |
|            | Akola      | 19.85 - 21.26 °N | 76.63 - 77.73 °E |
|            | Washim     | 19.61 - 21.16 °N | 76.70 - 77.40 °E |
|            | Amravati   | 20.53 - 21.76 °N | 76.61 - 78.45 °E |
|            | Yavatmal   | 19.26 - 20.42 °N | 77.18 - 79.98 °E |
| Nagpur     | Wardha     | 20.30 - 21.35 °N | 78.06 - 79.25 °E |
|            | Nagpur     | 20.35 - 21.44 °N | 75.15 - 79.40 °E |
|            | Bhandara   | 20.65 - 21.63 °N | 79.45 - 80.70 °E |
|            | Chandrapu  | 18.40 - 20.50 °N | 78.50 - 80.60 °E |
|            | Gadchiroli | 18.43 - 21.50 °N | 79.45 - 80.53 °E |
|            | Gondia     | 20.39 - 21.38 °N | 79.27 - 80.42 °E |

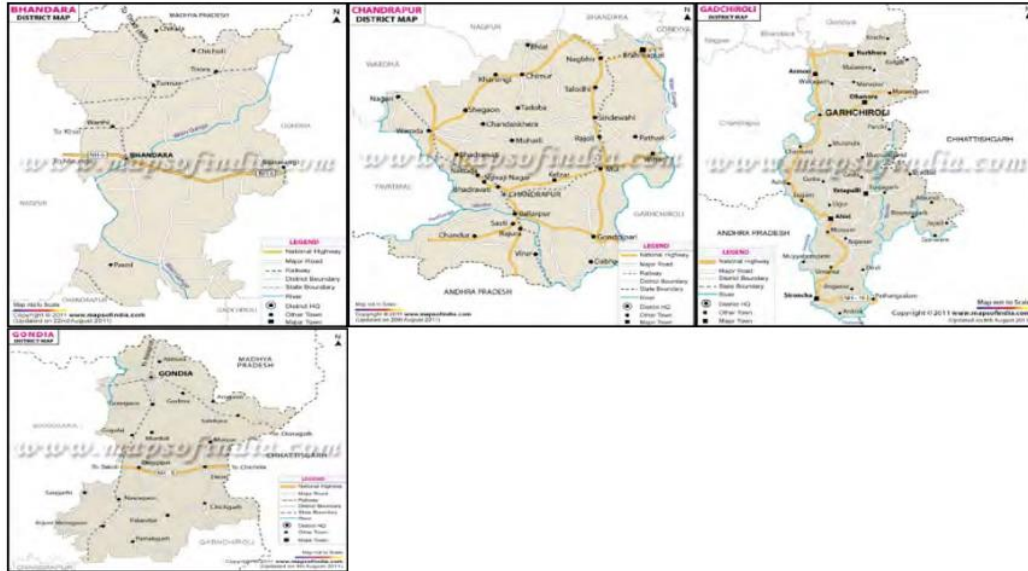


Map of India



Map of Maharashtra





| Aurangabad |                     |            | Jalna |                     |        |
|------------|---------------------|------------|-------|---------------------|--------|
| Sr.        | Name of the Village | Taluka     | Sr.   | Name of the Village | Taluka |
| 1          | Daigavhan           | Aurangabad | 1     | Baji Umrada Tanda   | Jalna  |
| 2          | Darakwadi           | Aurangabad | 2     | Bapkal              | Jalna  |
| 3          | Daregaon            | Aurangabad | 3     | Bathan Bk.          | Jalna  |
| 4          | Daulatabad          | Aurangabad | 4     | Bethlam             | Jalna  |
| 5          | Demani              | Aurangabad | 5     | Bhanunaik Tanda     | Jalna  |
| 6          | Devlai              | Aurangabad | 6     | Bhatepuri           | Jalna  |
| 7          | Dharmapur           | Aurangabad | 7     | Bhatkheda           | Jalna  |
| 8          | Dhawalapuri         | Aurangabad | 8     | Bhilpuri Kh.        | Jalna  |
| 9          | Dhondkheda          | Aurangabad | 9     | Bibi                | Jalna  |
| 10         | Dhopateshwar        | Aurangabad | 10    | Borgaon             | Jalna  |
| 11         | Donwada             | Aurangabad | 11    | Borkhedi            | Jalna  |
| 12         | Dudhad              | Aurangabad | 12    | Bramhankheda        | Jalna  |
| 13         | Eklahara            | Aurangabad | 13    | Chitli Putli        | Jalna  |
| 14         | Ekod                | Aurangabad | 14    | Dahifal             | Jalna  |
| 15         | Fattepur            | Aurangabad | 15    | Dambri              | Jalna  |
| 16         | Gadhe Jalgaon       | Aurangabad | 16    | Daregaon            | Jalna  |
| 17         | Gadiwat             | Aurangabad | 17    | Daregaon            | Jalna  |
| 18         | Gadiwat Tanda       | Aurangabad | 18    | Deomurti            | Jalna  |
| 19         | Gandheli            | Aurangabad | 19    | Dhagi               | Jalna  |
| 20         | Gangapur Jahagir    | Aurangabad | 20    | Dhandegaon          | Jalna  |
| 21         | Gangapur Nehari     | Aurangabad | 21    | Dhanora             | Jalna  |
| 22         | Garkheda            | Aurangabad | 22    | Dhara               | Jalna  |
| 23         | Gavadari Tanda      | Aurangabad | 23    | Dharkalyan          | Jalna  |
| 24         | Georai              | Aurangabad | 24    | Dhawedi             | Jalna  |
| 25         | Georai Kubri        | Aurangabad | 25    | Dudhana Kalegaon    | Jalna  |
|            |                     |            | 26    | Erandwadgaon        | Jalna  |
|            |                     |            | 27    | Ganeshpur           | Jalna  |
|            |                     |            | 28    | Gawali Pokhri       | Jalna  |
|            |                     |            | 29    | Ghanewadi           | Jalna  |
|            |                     |            | 30    | Ghetuli             | Jalna  |

| Aurangabad |                     |        | Jalna |                     |        |
|------------|---------------------|--------|-------|---------------------|--------|
| Sr.        | Name of the Village | Taluka | Sr.   | Name of the Village | Taluka |
|            |                     |        | 31    | Ghodegaon           | Jalna  |
|            |                     |        | 32    | Gokulnagar          | Jalna  |
|            |                     |        | 33    | Golapangri          | Jalna  |
|            |                     |        | 34    | Ahankar Devlgaon    | Jalna  |
|            |                     |        | 35    | Ambedkarwadi        | Jalna  |
|            |                     |        | 36    | Antarwala           | Jalna  |

| Parbhani |                     |          | Hingoli |                     |         |
|----------|---------------------|----------|---------|---------------------|---------|
| Sr.      | Name of the Village | Taluka   | Sr.     | Name of the Village | Taluka  |
| 1        | Aland               | Parbhani | 1       | Adgaon              | Basmath |
| 2        | Alapur pandhari     | Parbhani | 2       | Agdad               | Basmath |
| 3        | Amadapur            | Parbhani | 3       | Akoli               | Basmath |
| 4        | Ambe takli          | Parbhani | 4       | Amba                | Basmath |
| 5        | Anandwadi           | Parbhani | 5       | Ambanath            | Basmath |
| 6        | Angalgaon           | Parbhani | 6       | Aral                | Basmath |
| 7        | Arvi                | Parbhani | 7       | Asegaon             | Basmath |
| 8        | Asola               | Parbhani | 8       | Babhulgaon          | Basmath |
|          |                     |          | 9       | Bagdad              | Basmath |
|          |                     |          | 10      | Balegaon            | Basmath |
|          |                     |          | 11      | Barepurwadi         | Basmath |
|          |                     |          | 12      | Basmat              | Basmath |
|          |                     |          | 13      | Bhendegaon          | Basmath |
|          |                     |          | 14      | Bhogaon             | Basmath |
|          |                     |          | 15      | Bhoripgaon          | Basmath |
|          |                     |          | 16      | Borala              | Basmath |

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

| Beed |                     |        | Nanded |                     |        |
|------|---------------------|--------|--------|---------------------|--------|
| Sr.  | Name of the Village | Taluka | Sr.    | Name of the Village | Taluka |
| 20   | Balapur             | Bid    | 20     | Gadegaon            | Nanded |
| 21   | Barhanpur           | Bid    | 21     | Gangabet            | Nanded |
| 22   | Bedukwadi           | Bid    | 22     | Gopalchavdi         | Nanded |
| 23   | Belapuri            | Bid    |        |                     |        |
| 24   | Belgaon             | Bid    |        |                     |        |
| 25   | Belkhandi           | Bid    |        |                     |        |

| Osmanabad |                     |           | Latur |                      |        |
|-----------|---------------------|-----------|-------|----------------------|--------|
| Sr.       | Name of the Village | Taluka    | Sr.   | Name of the Village  | Taluka |
| 1         | Alni                | Osmanabad | 1     | Chata                | Latur  |
| 2         | Ambehol             | Osmanabad | 2     | Chikhali Thana       | Latur  |
| 3         | Ambejawalga         | Osmanabad | 3     | Chikhurda            | Latur  |
| 4         | Ambewadi            | Osmanabad | 4     | Chincholi Ballalnath | Latur  |
| 5         | Ansarda             | Osmanabad | 5     | Chincholi Rao        | Latur  |
| 6         | Arni                | Osmanabad | 6     | Chincholi Raowadi    | Latur  |
| 7         | Bamani              | Osmanabad | 7     | Dagadwadi            | Latur  |
| 8         | Baramgaon Bk.       | Osmanabad | 8     | Dhakani              | Latur  |
| 9         | Baramgaon Kh.       | Osmanabad | 9     | Dhanegaon            | Latur  |
| 10        | Bavi                | Osmanabad | 10    | Dhanori              | Latur  |
| 11        | Bavi Dhoki          | Osmanabad | 11    | Dhoki                | Latur  |
| 12        | Begada              | Osmanabad | 12    | Dindegaon            | Latur  |
|           |                     |           | 13    | Ekurga               | Latur  |
|           |                     |           | 14    | Gadhawad             | Latur  |
|           |                     |           | 15    | Gangapur             | Latur  |
|           |                     |           | 16    | Ganjur               | Latur  |
|           |                     |           | 17    | Gategaon             | Latur  |

| Buldhana |                     |          | Akola |                     |        |
|----------|---------------------|----------|-------|---------------------|--------|
| Sr.      | Name of the Village | Taluka   | Sr.   | Name of the Village | Taluka |
| 1        | Adgaon              | Khamgaon | 1     | Agar                | Akola  |
| 2        | Akoli               | Khamgaon | 2     | Akhatwada           | Akola  |
| 3        | Ambetakali          | Khamgaon | 3     | Akkalkot            | Akola  |
| 4        | Ambikapur           | Khamgaon | 4     | Akola               | Akola  |
| 5        | Amsari              | Khamgaon | 5     | Akoli Bk.           | Akola  |
| 6        | Antraj              | Khamgaon | 6     | Akoli Kh.           | Akola  |
| 7        | Asa                 | Khamgaon | 7     | Aliyabad            | Akola  |
| 8        | Atali               | Khamgaon | 8     | Amanatpur           | Akola  |
| 9        | Awar                | Khamgaon | 9     | Ambikapur           | Akola  |
| 10       | Belkhed             | Khamgaon | 10    | Anakwadi            | Akola  |
| 11       | Belura              | Khamgaon | 11    | Anvi                | Akola  |
| 12       | Bhalegaon           | Khamgaon | 12    | Apatapa             | Akola  |
| 13       | Bhandari            | Khamgaon | 13    | Apoti Bk            | Akola  |
| 14       | Bhendi              | Khamgaon | 14    | Apoti Kh            | Akola  |
| 15       | Bori                | Khamgaon | 15    | Babhulgaon          | Akola  |
| 16       | Borjawala           | Khamgaon | 16    | Badlapur            | Akola  |
| 17       | Bothakaji           | Khamgaon | 17    | Bahadarpur          | Akola  |
| 18       | Bothakoli           | Khamgaon | 18    | Bahirkhed           | Akola  |

| Buldhana |                     |          | Akola |                     |        |
|----------|---------------------|----------|-------|---------------------|--------|
| Sr.      | Name of the Village | Taluka   | Sr.   | Name of the Village | Taluka |
| 19       | Chikhali Bk.        | Khamgaon | 19    | Bakharabad          | Akola  |
| 20       | Chikhali Kh.        | Khamgaon | 20    | Bhamhapuri          | Akola  |
|          |                     |          | 21    | Bhaurad             | Akola  |
|          |                     |          | 22    | Bhod                | Akola  |
|          |                     |          | 23    | Birsingpur          | Akola  |
|          |                     |          | 24    | Bondarkhed          | Akola  |
|          |                     |          | 25    | Bondarkhed          | Akola  |
|          |                     |          | 26    | Borgaon             | Akola  |

| Washim |                     |        | Amravati |                     |          |
|--------|---------------------|--------|----------|---------------------|----------|
| Sr.    | Name of the Village | Taluka | Sr.      | Name of the Village | Taluka   |
| 1      | Adgaon Kh.          | Washim | 1        | Aliyabad            | Amravati |
| 2      | Adgaon N. Kata      | Washim | 2        | Amdapur             | Amravati |
| 3      | Adoli               | Washim | 3        | Amla                | Amravati |
| 4      | Anjankhed           | Washim | 4        | Angoda              | Amravati |
| 5      | Ansing              | Washim | 5        | Anjangaon bari      | Amravati |
| 6      | Asola               | Washim | 6        | Antora              | Amravati |
| 7      | Atkali              | Washim | 7        | Arhad               | Amravati |
| 8      | Babhulgaon          | Washim | 8        | Aurangpur           | Amravati |
| 9      | Bhatumra            | Washim | 9        | Bahilolpur          | Amravati |
|        |                     |        | 10       | Bhagvanpur          | Amravati |
|        |                     |        | 11       | Bhankheda Bk.       | Amravati |
|        |                     |        | 12       | Bhankheda Kh.       | Amravati |
|        |                     |        | 13       | Bodna               | Amravati |
|        |                     |        | 14       | Borgaon             | Amravati |
|        |                     |        | 15       | Brahman             | Amravati |

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

| Nagpur |                     |              | Bhandara |                     |          |
|--------|---------------------|--------------|----------|---------------------|----------|
| Sr.    | Name of the Village | Taluka       | Sr.      | Name of the Village | Taluka   |
| 1      | Ashta               | Nagpur Rural | 1        | Ajimabad            | Bhandara |
| 2      | Ashti               | Nagpur Rural | 2        | Ambadi              | Bhandara |
| 3      | Bahadura            | Nagpur Rural | 3        | Amgaon              | Bhandara |
| 4      | Bailwada            | Nagpur Rural | 4        | Arjuni              | Bhandara |

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

| Chandrapur |                      |            | Gadchiroli |                      |           |
|------------|----------------------|------------|------------|----------------------|-----------|
| Sr.        | Name of the Village  | Taluka     | Sr.        | Name of the Village  | Taluka    |
| 1          | Adegaon              | Chandrapur | 1          | Pavilasanpeth        | Chamorshi |
| 2          | Agarzari             | Chandrapur | 2          | Pettala Mal          | Chamorshi |
| 3          | Ajayapur Raiyyatwari | Chandrapur | 3          | Potepalli Patch      | Chamorshi |
| 4          | Ambhora              | Chandrapur | 4          | Potepalli Rayyatwari | Chamorshi |
| 5          | Anturla              | Chandrapur | 5          | Makepalli Mal        | Chamorshi |
| 6          | Arwat                | Chandrapur | 6          | Maler Chak           | Chamorshi |
| 7          | Belsani              | Chandrapur | 7          | Maler Mal            | Chamorshi |
| 8          | Bor Rith             | Chandrapur | 8          | Malkapur             | Chamorshi |
| 9          | Borda Indarpawar     | Chandrapur | 9          | Mangigaon            | Chamorshi |
| 10         | Chak Borda           | Chandrapur | 10         | Markanda Kansoba     | Chamorshi |
| 11         | Chak Nimbala         | Chandrapur | 11         | Markandadeo          | Chamorshi |
| 12         | Chak Pimpal Khut     | Chandrapur | 12         | Maroda               | Chamorshi |
| 13         | Chandsurla           | Chandrapur | 13         | Mohurli Mokasa       | Chamorshi |
| 14         | Chandur              | Chandrapur | 14         | Priyadarshani        | Chamorshi |
| 15         | Chargaon             | Chandrapur | 15         | Raipur               | Chamorshi |
| 16         | Chichala             | Chandrapur | 16         | Mudholi Rith         | Chamorshi |
| 17         | Chichpali            | Chandrapur | 17         | Mudholi Tukum        | Chamorshi |
| 18         | Chincholi            | Chandrapur | 18         | Murkhala             | Chamorshi |
| 19         | Chorala              | Chandrapur | 19         | Murkhala Chak        | Chamorshi |
| 20         | Chorgaon             | Chandrapur | 20         | Murmuri              | Chamorshi |
| 21         | Datala               | Chandrapur | 21         | Mutnur               | Chamorshi |
| 22         | Dewada               | Chandrapur | 22         | Nachangaon           | Chamorshi |
| 23         | Dhanora              | Chandrapur | 23         | Narendrapur          | Chamorshi |

| Chandrapur |                     |            | Gadchiroli |                      |           |
|------------|---------------------|------------|------------|----------------------|-----------|
| Sr.        | Name of the Village | Taluka     | Sr.        | Name of the Village  | Taluka    |
| 24         | Doni                | Chandrapur | 24         | Navargaon            | Chamorshi |
| 25         | Gawarala Rith       | Chandrapur | 25         | Navegaon             | Chamorshi |
| 26         | Ghanta Chauki       | Chandrapur | 26         | Navegaon Mal         | Chamorshi |
| 27         | Gondsawari          | Chandrapur | 27         | Navegaon Raiyyatwari | Chamorshi |
|            |                     |            | 28         | Navgram              | Chamorshi |
|            |                     |            | 29         | Navnitgram           | Chamorshi |
|            |                     |            | 30         | Navtala Tukum        | Chamorshi |
|            |                     |            | 31         | Netajinagar          | Chamorshi |
|            |                     |            | 32         | Nikatwada            | Chamorshi |
|            |                     |            | 33         | Nimgaon Riyyatwari   | Chamorshi |
|            |                     |            | 34         | Palaspur             | Chamorshi |
|            |                     |            | 35         | Pandhari Bhatal      | Chamorshi |
|            |                     |            | 36         | Pavi-muranda         | Chamorshi |
|            |                     |            | 37         | Rajangatta           | Chamorshi |
|            |                     |            | 38         | Rajgopalpur          | Chamorshi |
|            |                     |            | 39         | Rajur Bk             | Chamorshi |
|            |                     |            | 40         | Rajur Kh             | Chamorshi |
|            |                     |            | 41         | Ramala               | Chamorshi |

| Gondia |                     |         |
|--------|---------------------|---------|
| Sr.    | Name of the Village | Taluka  |
| 1      | Aasoli              | Gondiya |
| 2      | Adashi              | Gondiya |
| 3      | Ambhora             | Gondiya |
| 4      | Arjuni              | Gondiya |
| 5      | Badegaon            | Gondiya |
| 6      | Bagholi             | Gondiya |
| 7      | Bajartola           | Gondiya |
| 8      | Balamatola          | Gondiya |
| 9      | Banathar            | Gondiya |
| 10     | Barbaspura          | Gondiya |
| 11     | Batana              | Gondiya |
| 12     | Bhadutola           | Gondiya |
| 13     | Bhadyatola          | Gondiya |
| 14     | Bhagwattola         | Gondiya |
| 15     | Bhanpur             | Gondiya |
| 16     | Bijaitola           | Gondiya |
| 17     | Birsi               | Gondiya |
| 18     | Birsi               | Gondiya |
| 19     | Birsola             | Gondiya |
| 20     | Brahmantola         | Gondiya |
| 21     | Chandanitola        | Gondiya |
| 22     | Changera            | Gondiya |
| 23     | Chargaon            | Gondiya |
| 24     | Chhipiya            | Gondiya |
| 25     | Chichtola           | Gondiya |
| 26     | Chiramantola        | Gondiya |
| 27     | Chulod              | Gondiya |

### 1.13 Conditions Prior to Project Initiation

In accordance to the Paragraph 4 of the chosen methodology, AMS - II.G; “Energy Efficiency measures in thermal applications of non-renewable biomass”, EB 68, Version 04: baseline of the project activity is “the use of fossil fuels for meeting similar thermal energy needs”. In absence of the project activity the beneficiaries could have opted for the underneath options for the purpose of cooking

1. Continuation of use of traditional stoves for the purpose of cooking
2. Use of kerosene for cooking
3. Use of LPG for Cooking
4. Use of biomass based improved cook stove

Use of all the above options for purpose of cooking is permitted as per the regulation of the host country. However, use of few of the fuel options stated above faces barriers as their use in the rural areas are concerned and are depicted below.

As per the study by “National Institute of Science, Technology & Development Studies (NISTADS), CSIR, New Delhi” it is highlighted that poor rural household could not afford and also not willing to opt for the improved cook stoves since wood are available for free. The household that opts for the improved stoves only opts for subsidy hence the use of biomass based cook stoves is not a pertinent or plausible scenario. The percentages of population relying on different fuel type in rural areas of Maharashtra for the purpose of cooking are as follows<sup>8</sup> –

|                          | Firewood | LPG | Kerosene | No cooking arrangement | Others |
|--------------------------|----------|-----|----------|------------------------|--------|
| Percentage of population | 78%      | 15% | 1%       | 3%                     | 2%     |

From above figures it is quite evident that, the percentages of population depending on firewood in the rural areas are quite high in the state. Publication titled “Household Energy and the Environment”<sup>9</sup> depicts that, although nationally there has been a decrease in the share of traditional fuels, as biomass is being increasingly substituted by commercial fuels, the shift to commercial fuels has been negligible in rural areas. The energy consumption in rural areas is guided by the availability and accessibility of local biomass resources; the competing uses for biomass; availability of commercial energy sources; the cost of commercial fuels such as LPG and kerosene (NCAER 1985); absence of an effective supply especially in the rural areas (TERI 1998); and inadequate production and refining capacity of LPG (Ravindranath and Ramakrishna 1997). Over and above the above barriers the issues of affordability of commercial fuel is quite a bigger issue amongst the populations conceived under the project activity and hence the use of commercial fuel is not usual

<sup>8</sup> TERI Energy Data Directory & Yearbook 2010

<sup>9</sup> Preeti Malhotra, [http://www.hedon.info/BP42\\_EnvironmentalImplicationsOfTheEnergyLadderInRuralIndia](http://www.hedon.info/BP42_EnvironmentalImplicationsOfTheEnergyLadderInRuralIndia)

scenario amongst the BPL and ST population. Therefore, use of LPG or Kerosene is not the plausible baseline option.

From above it can be concluded that the use of biomass in the traditional cook stove is the most plausible baseline option for the target population.

The methodology identifies the baseline and suggests for baseline emission factor therefore, the same is considered as precedence and assessment of alternatives is not carried out for the purpose of determination of baseline and emission factor. According to Paragraph 5 of the applicable methodology, default emission factor of 81.6 tCO<sub>2</sub>e/TJ is considered for estimation of emission reduction. Emission reductions would be calculated as:

$$ER_y = B_{y,savings} \times f_{NRB,y} \times NCV_{biomass} \times EF_{projectedfossilfuel}$$

Where:

|                                   |                                                                                                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| ER <sub>y</sub>                   | Emission reductions during the year y in tCO <sub>2</sub> e                                                                                     |
| B <sub>y,savings</sub>            | Quantity of woody biomass that is saved in tonnes                                                                                               |
| f <sub>NRB,y</sub>                | Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass                              |
| NCV <sub>biomass</sub>            | Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)                         |
| EF <sub>projectedfossilfuel</sub> | Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO <sub>2</sub> /TJ <sup>3</sup> |

$$B_{y,savings} = B_{old} * (1 - \eta_{old}/\eta_{new})$$

Where,

|                        |                                                                                                                                                                                                                                 |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B <sub>y,savings</sub> | Quantity of woody biomass that is saved in tonnes                                                                                                                                                                               |
| B <sub>old</sub>       | Quantity of woody biomass used in the absence of the project activity in tonnes                                                                                                                                                 |
| η <sub>old</sub>       | A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney. |
| η <sub>new</sub>       | Efficiency of the system being deployed as part of the project activity (fraction), as determined using the Water Boiling Test (WBT) protocol.                                                                                  |

#### Determination of Bold:

According to Paragraph 7 of the chosen methodology; Bold is determined by using the Option (a) “Calculated as the product of the number of systems multiplied by the estimated average annual consumption of woody biomass per appliance (tonnes/year). This can be derived from historical data or a survey of local usage.”

According to the Wood Fuel Trade in India – Food and Agricultural Organisation of the United Nation, July 2001; per capita per day biomass consumption is 1.52 kg and per household

per day fuel wood consumption is 5.60 kg. Annual consumption per household per day is therefore estimated at 2.044 tonnes.

Further, following the TERI Energy Data Directory and Yearbook 2010; per capita per month consumption of fire wood in Maharashtra is 25.51 kg<sup>10</sup>. With average population size of 4.8 person/ household<sup>11</sup> (the population size of 4.8 persons per household is obtained from the secondary literature publication that indicates the average number of personnel per household in rural areas of Maharashtra as 4.8); annual consumption of firewood is estimated at 1.469 tonnes.

Being the annual household fuel consumption data estimated on the basis of the TERI Energy Data Directory is most conservative the value of 1.469 tonnes/household/year is considered. Therefore,

$$B_{old} = 1.469 \text{ tonnes/ household/ year.}$$

#### **Determination of $\eta_{old}$**

Since, the project is replacing traditional cooking system with no improved combustion air supply or flue gas ventilation system therefore, efficiency of the system being replaced is chosen as per Alternative 2 of Option 2 of Paragraph 6 as default value of 0.10.

#### **Determination of $\eta_{new}$**

Efficiency of the system being deployed in the project activity is chosen as 29.88%<sup>12</sup> following the Performance Test of Improved Cook stove done by Department of Renewable Energy Sources, Maharana Pratap University of Agriculture & Technology.

$$\eta_{new} = 29.88\%$$

#### **$f_{NRB,y}$ is determined as follows:**

According to Paragraph 8 of the chosen methodology, "Project participants shall determine the shares of renewable and non-renewable woody biomass in Bold (the quantity of woody biomass used in the absence of the project activity) the total biomass consumption using nationally approved methods (e.g., surveys or government data if available) and then determine  $f_{NRB,y}$ ".

The fraction of woody biomass saved due to the project activity that can be established as non-renewable is estimated as –

$$f_{NRB,y} = NRB / (NRB + DRB)$$

Where,

NRB: Non Renewable Biomass (NRB) is the quantity of woody biomass used in the absence of the project activity (Bold) minus the DRB component.

<sup>10</sup> Ref: TERI Energy Data Directory and Year book 2010

<sup>11</sup> Ref: Pg.No. -3 of A Report on "Morbidity & Health Care Based on Data Collected in Central, State & Pooled Samples of 60th Round of National Sample Survey Jan - Jun2004"

<sup>12</sup> Thermal Efficiency Test Report of Improved Cook stove tested at Biomass Cook stove Testing Centre, Dept. of Renewable Energy Sources, Udaipur

According to the Paragraph 9 of the applicable methodology; Demonstrably Renewable woody Biomass (DRB) is justified by satisfying the condition no. (1) in following manner –

The wood extracted from forest land in a sustainable quantity is considered as renewable. The wood extracted from forest land in a sustainable quantity is considered as renewable. Further, to demonstrate the woody biomass is renewable the following conditions as per paragraph 9, are satisfied.

1. Land Area Remain a Forest: The forest area (also termed as recorded forest area and represents the total area of land as per the Government records) in Maharashtra across the last five years is as follows –

| Study Period | Total area under forest (sq.km) | Reporting Year (Economic Survey Report ) |
|--------------|---------------------------------|------------------------------------------|
| 2010-11      | 61,939                          | 2011-12                                  |
| 2009-10      | 61,939                          | 2010-11                                  |
| 2008-09      | 61,939                          | 2009-10                                  |
| 2007-08      | 61,939                          | 2008-09                                  |
| 2006-07      | 61,939                          | 2007-08                                  |

The table above represents the total area of land under forest in Maharashtra and confirms that, the land under forest continued to remain under forest.

Therefore, it is evident from above information that, the land area under forest continued to remain under forest.

2. Sustainable management practices are undertaken on these land areas to ensure, in particular, that the level of carbon stocks on these land areas does not systematically decrease over time (carbon stocks may temporarily decrease due to harvesting). Sustainable management practices like afforestation, reforestation, preservation and conservation of forest land is undertaken in the country as a part of the National Forest Policy, 1988 by Ministry of Environment & Forests, Govt. Of India. The National Mission for Green India is one of the eight Missions of National Action Plan on Climate Change; that calls for forest conservation policy as policy decision to be implemented by the state government.

In order to prevent illicit cutting of trees and following the request of the government of India, the Maharashtra State had taken an important and pioneering decision regarding forest management with the active participation of the rural people<sup>13</sup>. The Joint Forest Management/Forest Protection Committee has selected forest land including degraded and barren forest land and similar other land in rural areas for sustainable management.

3. Any national or regional forestry and nature conservation regulations are complied with. According to the Circular No. FLD/1000/CR 243/F-3 of Government of Maharashtra, the forest land under the state of Maharashtra is abided by Forest Conservation Act 1980. The Forest (Conservation) Act, 1980 and amended in 1988<sup>14</sup> was enacted with a view to

<sup>13</sup> <http://www.iifm.ac.in/databank/jfm/mahfdres.html>

<sup>14</sup> <http://www.moef.nic.in/legis/forest/forest2.html>

check further deforestation which ultimately results in ecological imbalance; and therefore, the provisions made therein for the conservation of Forests and for matters connected therewith, must apply to all forests irrespective of the nature of ownership or classification thereof. This definition of forest covers all statutorily recognized forests, whether designated as reserved, protected or otherwise for the purpose of section 2 (i) of the Forest (Conservation) Act. The Forest Conservation Act vide paragraph 2 also impose restriction on the de-reservation of forests or use of forest land for non-forest purpose.

Since, the woody biomass originating from land area under forest fulfils the specified conditions the same is considered to be renewable.

### Fuel Wood Demand

The demand of fuel wood in context of Maharashtra is estimated from percentage share of the rural population relying on fire wood and average per-capita fuel wood consumption. The demand of fire wood in the state is estimated as follows:

| Particulars                                             | Data          | Unit        | Reference                                                                                                                                                                                                                                      |
|---------------------------------------------------------|---------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Rural Population                                        | 55,778,000.00 | Nos.        | Economic Survey of Maharashtra 2010-11 (Pg.No.-3)                                                                                                                                                                                              |
| Percentage of households reliant on biomass for cooking | 78.00         | %           | Teri Energy Data Directory & Yearbook 2010(Pg. No. 294)<br>Although study by NSSO depicts higher percentage of dependency of the rural population in lower strata of MCPE group the conservative figure is used for the purpose of calculation |
| Population Dependent on the Fuel Wood                   | 43,506,840.00 | Nos.        | Calculated                                                                                                                                                                                                                                     |
| Per capita fuel wood consumption for cooking            | 25.51         | kg/ month   | Teri Energy Data Directory & Yearbook 2010(Pg. No.-293)                                                                                                                                                                                        |
| Fuel Wood requirement                                   | 13,318,313.86 | tonne /year | Calculated                                                                                                                                                                                                                                     |

### Supply of Fire Wood

Forest is the major source of fire wood supply followed by Tree outside Forest. The amount of fire wood that can be sustainably extracted from the forest and Tree outside Forest land is estimated from the area under different forest type and sustainable rate of extraction from forest and plantation. The same method is applied for estimation of sustainable extraction potential from Tree outside Forest.

As a conservative approach, the land under open forest and scrub are also included.

| Sustainable Fuel wood Extraction From Forest Area |       |         |                            |                        |
|---------------------------------------------------|-------|---------|----------------------------|------------------------|
| Particulars                                       | Data  | Unit    | Reference                  | Remarks                |
| Very Dense Forest                                 | 8,736 | sq. km. | Pg. No. -173, Ch -9.16. of | Land with forest cover |

|                                                            |        |                                                                   |                                                                                                                                                                                                                                                                                    |                                                                 |
|------------------------------------------------------------|--------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
|                                                            |        |                                                                   | India State of Forest Report 2011 -FSI                                                                                                                                                                                                                                             | having canopy density above 70%                                 |
| Medium Dense Forest                                        | 20,815 | sq. km.                                                           | Pg. No. -173, Ch -9.16. of India State of Forest Report 2011 -FSI                                                                                                                                                                                                                  | All Lands with forest cover having a canopy density of 40%- 70% |
| Open Forest                                                | 21,095 | sq. km.                                                           | Pg. No. -173, Ch -9.16. of India State of Forest Report 2011 -FSI                                                                                                                                                                                                                  | Land with forest cover having density between 10-40%            |
| Scrub                                                      | 4,157  | sq. km.                                                           | Pg. No. -173, Ch -9.16. of India State of Forest Report 2011 -FSI                                                                                                                                                                                                                  | Degraded forest land with canopy cover less than 10%            |
| Total area under forest                                    | 54,803 | sq. km.                                                           |                                                                                                                                                                                                                                                                                    | Calculated                                                      |
| Forest Cover In Different Forest Type                      |        |                                                                   |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical dry deciduous forest                              | 57.40% | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI | FSI Report<br>Title: India State of Forest Report 2011<br>By: Forest Survey of India<br>Link: www.fsi.nic.in<br>Report No: 12th<br>Data Period: October 2008 - March 2009                                                                                                          |                                                                 |
| Tropical moist deciduous forest                            | 29.85% | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical semi evergreen                                    | 7.72%  | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical thorn forest                                      | 1.02%  | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI |                                                                                                                                                                                                                                                                                    |                                                                 |
| Sub-tropical broad leaved hill forest                      | 1.54%  | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI |                                                                                                                                                                                                                                                                                    |                                                                 |
| Littoral and Swamp                                         | 0.09%  | Pg. No. -174, Ch -9.16. of India State of Forest Report 2011 –FSI |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical dry deciduous forest                              |        | 31,457                                                            | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Tropical moist deciduous forest                            |        | 16,359                                                            | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Tropical semi evergreen                                    |        | 4,231                                                             | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Tropical thorn forest                                      |        | 559                                                               | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Sub-tropical broad leaved hill forest                      |        | 844                                                               | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Littoral and Swamp                                         |        | 49                                                                | sq. km.                                                                                                                                                                                                                                                                            | Calculated                                                      |
| Sustainable Rate Of Extraction From Forests And Plantation |        |                                                                   |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical dry deciduous forest                              | 0.22   | tonne /ha/yr                                                      | Pg. No. 254 of Forestry for sustainable biomass production and carbon sequestration in India- N. H. Ravindranath (Centre for Ecological Sciences, IISc, Bangalore), P. Sudha (Centre for Ecological Sciences, IISc, Bangalore), Sandhya Rao (Dept. of Civil Engineering IIT Delhi) |                                                                 |
| Tropical moist deciduous forest                            | 0.27   | tonne/ha/yr                                                       |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical semi evergreen                                    | 0.39   | tonne /ha/yr                                                      |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical thorn forest                                      | 0.24   | tonne/ha/yr                                                       |                                                                                                                                                                                                                                                                                    |                                                                 |
| Sub-tropical broad leaved hill forest                      | 0.36   | tonne /ha/yr                                                      |                                                                                                                                                                                                                                                                                    |                                                                 |
| Littoral and Swamp                                         | 0.36   | tonne /ha/yr                                                      |                                                                                                                                                                                                                                                                                    |                                                                 |
| Renewable Biomass Extraction From Forest Area              |        |                                                                   |                                                                                                                                                                                                                                                                                    |                                                                 |
| Tropical dry deciduous forest                              |        | 692,052                                                           | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Tropical moist deciduous forest                            |        | 441,684                                                           | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Tropical semi evergreen                                    |        | 165,000                                                           | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Tropical thorn forest                                      |        | 13,415                                                            | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Sub-tropical broad leaved hill forest                      |        | 30,382                                                            | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Littoral and Swamp                                         |        | 1,775                                                             | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Total Renewable Biomass Extraction from Forest             |        | 1,344,308                                                         | tonne /year                                                                                                                                                                                                                                                                        | Calculated                                                      |
| Sustainable Extraction from Plantation and ToF             |        |                                                                   |                                                                                                                                                                                                                                                                                    |                                                                 |
| Plantation                                                 | 1,304  | sq. km                                                            | India State of Forest Report 2011 - FSI (Calculated                                                                                                                                                                                                                                |                                                                 |

|                                             |      |              |                                                                                                                                                                                                                                                                                     |
|---------------------------------------------|------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| /TreeOutside Forest                         |      |              | considering the area under Plantation/ToF as 2.38%)                                                                                                                                                                                                                                 |
| Sustainable Extraction rate from plantation | 2.00 | tonne /ha/yr | Pg. No. 254 of Forestry for sustainable biomass production and carbon sequestration in India - N. H. Ravindranath (Centre for Ecological Sciences, IISc, Bangalore), P. Sudha (Centre for Ecological Sciences, IISc, Bangalore), Sandhya Rao (Dept. of Civil Engineering IIT Delhi) |

#### Estimation of $f_{NRB}$

|                                                         |               |             |
|---------------------------------------------------------|---------------|-------------|
| Total Renewable Biomass Extraction from Plantation/ ToF | 260,862.28    | tonne /year |
| Total Sustainable biomass available                     | 1,605,170.28  | tonne /year |
| Fuel Wood requirement                                   | 13,318,313.86 | tonne /year |
| NRB                                                     | 11,713,143.58 | tonne /year |
| $f_{NRB}$                                               | <b>87.90%</b> |             |

Following the Paragraph 10 of the applicable methodology, the  $f_{NRB}$  estimation is estimated as above and also two supporting indicators are established through the following –

- Survey results, national or local statistics, studies, maps or other sources of information, such as remote-sensing data, that show that carbon stocks are depleting in the project area.
- Increasing trends in fuel wood prices indicating a scarcity of fuel-wood

### 1. Depletion of Carbon Stock

According to the India State of Forest Report by Forest Survey of India, Ministry of Environment & Forests, Govt. of India there has been a conversion of the dense and moderately dense forest, to open forest due to felling, pruning or thinning of trees in the forest areas. An increase in the area of open forest is related to diversion of very dense and moderate dense forest to open forest. As per the Government of India Sustainable Forest Management Policy Land converted to open forest are taken up for plantation activity or promote natural or artificial regeneration. In this context it is also worthwhile to note that, the department of forest is undertaking initiatives towards plantation activity.

The table below represent the area under different forest cover:

|      |            |                  |             | All area in km <sup>2</sup> |
|------|------------|------------------|-------------|-----------------------------|
| Year | Very Dense | Moderately Dense | Open Forest | Total                       |
| 2011 | 8,736      | 20,815           | 21,095      | 50,646                      |
| 2009 | 8,739      | 20,834           | 21,077      | 50,650                      |
| 2005 | 8,747      | 20,847           | 21,067      | 50,661                      |

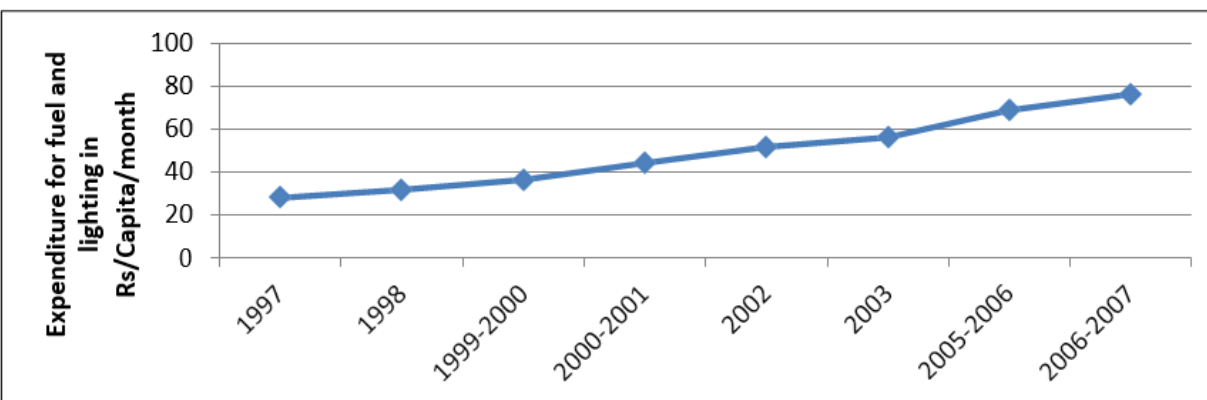
In accordance to the **Population Pressure and Deforestation in India- Population Research Centre, Institute of Economic Growth – Delhi**; the forest's growing stock reflects the quality of forest cover in terms of crown densities. The study exhibits the depletion in the forest stock in 1997 over 1989. Considering the dense forest growing stock is 67.6 cubic metre/hectare and open forest growing stock as 28.5 cubic metre/hectare; the volume of the growing stock in 1989 is estimated to be 227,592,000 cubic metres which is lowered to 223,516,000 cubic metres in 1997. The reduction in the volume of growing stock is estimated at 2% from 1997 in compared to 1989.

| State       | Volume of growing stock in 1989 (cubic metres) | Volume of growing stock in 1997 (cubic metres) | Percentage change in volume of growing stock |
|-------------|------------------------------------------------|------------------------------------------------|----------------------------------------------|
| Maharashtra | 227,592,000                                    | 223,516,000                                    | -2%                                          |

## 2. Increase in fuel wood price trend

As per the consumer expenditure survey carried out by National Sample Survey Organisation in 2004; it has been portrayed that 54% of the total consumption expenditure for cooking and lighting in rural areas pertains to fuel wood consumption. The expenditure across the year is presented as follows:

| Year                                         | 1997  | 1998  | 1999-2000 | 2000-2001 | 2002  | 2003  | 2005-2006 | 2006-2007 |
|----------------------------------------------|-------|-------|-----------|-----------|-------|-------|-----------|-----------|
| Average Monthly Per Capita Expenditure (Rs.) | 27.97 | 31.79 | 36.45     | 44.14     | 51.70 | 56.20 | 68.77     | 76.20     |



Since expenditure on fuel wood comprises of 43% of the total expenditure on fuel and lighting (considering 2004-05 data) it can be assumed that the cost of fire wood will increase in line with the increase in expenditure on fuel and light. Moreover the fact is also established from the mean annual increase in the price of the different energy products use for cooking and lighting and is as follows:

The trend in depletion of the carbon stock and rise of the fuel wood price is mainly due to increased demand and supply gap and unsustainable extraction or felling thereof. With the increase in demand of fire wood owing to population pressure and –limited and decreased potential for supply gap of fuel wood due depletion of carbon stocks (forest cover) the price is increasing. As the total biomass availability is unable to cater the demand of unsustainable extraction and pilferage is on the way towards depletion of the forest cover. The depletion of the carbon stock is due to the unsustainable extraction of biomass from the forest land and not due to any national policy. The national policy is aimed towards increasing of the forest area as the total area of forest at present is lower than the projected and required forest area as stipulated by the Govt. of India. Therefore, depletion of carbon stock or rise of the fuel wood price is not due to any national and Sectoral regulations but due to the stiffening of the gap between the demand and supply of fire wood in the region.

Please refer to section B 4 of PDD of the UNFCCC registered CDM project with Ref No. 9434 through the web link

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

## 1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There has been no policy regulation or legal enforcement that promotes deforestation of forest degradation in host country as well as in the region. National forest policy 1988, Government of India, Ministry of Environment and Forest, points out the requirement of forest conservation in the light of forest depletion in the country. Revenue and Forest Department, Government of Maharashtra vide circular no. FLD/1000/CR 243/F-3 16-December-2004, paragraph 3 has directed to prevent further deforestation in line with section 2 of the Forest Conservation Act 1980. The National mission for Green India, one of the eight Missions on National Action plan on Climate Change has also pointed out use of efficient biomass stoves as a measure towards preventing forest degradation.

The trend in depletion of the carbon stock and rise of the fuel wood price is mainly due to increased demand and supply gap and unsustainable extraction or felling thereof. With the increase in demand of fire wood owing to population pressure and –limited and decreased potential for supply gap of fuel wood due depletion of carbon stocks (forest cover) the price is increasing. As the total biomass availability is unable to cater the demand of unsustainable extraction and pilferage is on the way towards depletion of the forest cover. The depletion of the carbon stock is due to the unsustainable extraction of biomass from the forest land and not due to any national policy. The national policy is aimed towards increasing of the forest area as the total area of forest at present is lower than the projected and required forest area as stipulated by the Govt. of India. Therefore, depletion of carbon stock or rise of the fuel wood price is not due to any national and Sectoral regulations but due to the stiffening of the gap between the demand and supply of fire wood in the region.

The design of the cook stove is certified by Bureau of Indian Standards relating to its appropriateness to, IS 13152 (Part1). The standard was adopted by Bureau of Indian Standard after the draft finalized by the oil burning Appliances Sectional Committee had been approved by Heavy Mechanical Engineering Division Council.

The Project has received necessary approvals for development and commissioning for cook stove project from the state Nodal agencies and is in compliance to the local laws and regulations.

## 1.15 Participation under Other GHG Programs

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

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

### 1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by any other GHG programs.

## 1.16 Other Forms of Credit

### 1.16.1 Emissions Trading Programs and Other Binding Limits

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

### 1.16.2 Other Forms of Environmental Credit

Project has been registered with UNFCCC under Clean Development Mechanism program. Registration reference number is 9434. Project Proponent has submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration. Project Participant is not taking REC benefits for the same emission reductions.

## 1.17 Additional Information Relevant to the Project

### Leakage Management

Not applicable to this project activity.

### Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

### Sustainable Development

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

#### **Social benefits:**

- Reduces drudgery of women and children of rural areas (due to reduced fuel wood use) by reducing time spent and distance travelled for fuel wood collection.

Reduction in firewood requirement would help in spending more time in productive activities such as education, employment etc.

- Improves overall health (particularly diseases related to respiratory system) of women and children by reducing smoke in the kitchen.

**Economic Benefits:**

- Improves the local environment by reducing rate of forest degradation /deforestation in the project area. Conservation of forest will not only reduce non-renewable biomass demand and also reduce soil erosion and loss of biodiversity as a consequence of deforestation<sup>18</sup>.
- Reduces emission of black carbon to the atmosphere.
- Reduces Green-house gas emissions.

**Economic benefits:**

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

**Technological benefits:**

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

**Further Information**

There are no information or incidents that will have bearing on the eligibility of the project, the net GHG emission reductions or removals, or the quantification of the project's net GHG emission reductions or removals.

## 2 SAFEGUARDS

### 2.1 No Net Harm

According to the Ministry of Environment and Forests (MoEF), Government of India, under the Environment Impact Assessment Notification vide S .O.1533(E), dated 14/09/2006; the project activity of utilization of Improved Cook stove for cooking in rural households does not require environmental impact assessment study to be carried out.

### 2.2 Local Stakeholder Consultation

Please refer to sections E 1 and E 2 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

## 2.3 Environmental Impact

Please refer to D 1 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

## 2.4 Public Comments

This project was open for public comment from 22-March-2021 to 21-April-2021. There have been no negative comments during the commenting period.

## 2.5 AFOLU-Specific Safeguards

Not applicable

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

The approved baseline and monitoring methodology applied for the project activity is:

Consolidated baseline methodology for “Energy efficiency measures in thermal applications of non-renewable biomass”; AMS II-G, Version 04.0.0 Sectoral Scope: 03, EB 68.

## 3.2 Applicability of Methodology

The project activity involves replacement of traditional cook stoves by improved cook stoves. The improved cook stoves owing to its higher combustion efficiency of 29.88% in comparison to the 10% efficiency of the traditional cook stoves results in energy efficiency improvement and same do not exceed the equivalent of 60 giga watt hour thermal (GWhth) per year of energy savings. As such in accordance to “General Guidelines for SSC CDM Methodologies ” EB 69 Annex 27, Version 19; the project is selected for applying small scale methodologies under Type II.

As the cumulative energy saving from the project activity is less than 20 GWh/annum or 60 GWhth/annum and each of the independent subsystems i.e. Improved cook stove used in household for the purpose of cooking results an estimated annual energy savings of 4.073 MWhth or 1.358 MWh (detailed calculation presented in section B.5 of the PDD) which is well smaller than the permissible limit of 600 MWhth. Therefore, the project is consider

appropriate to be developed under micro small scale guidelines. The applicability criteria of the chosen methodology AMS-II. G. (Version 04) is satisfied by the project activity in following manner:

**Criteria 1:**

This category comprises appliances involving the efficiency improvements in the thermal applications of non-renewable biomass. Examples of these technologies and measures include the introduction of high efficiency<sup>66</sup> biomass fired cook stoves<sup>67</sup> or ovens or dryers and/or improvement of energy efficiency of existing biomass fired cook stoves or ovens or dryers.

**Justification:** The project activity involves dissemination of higher efficiency biomass fired cook stoves use as household appliances (29.88% as tested from MNRE approved centre) for cooking purpose<sup>68</sup>. This will contribute in reduction of non-renewable biomass consumption which would have been otherwise consumed by less efficient cook stoves. Since, it is an introduction of high efficiency cook stove the above condition is justified.

**Criteria 2:**

Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.

**Justification:** Use of non-renewable biomass is established through demonstration of gap between the demand of fire wood and silviculturally permissible production of biomass from forest and tree outside forest. The fact is established using published literature referring to the following studies

**Food and Agricultural Organization of United Nation - Regional Wood Energy Development Programme in Asia:**

The literature highlights gap in demand and supply of fuel wood across the country as well as across the state of Maharashtra. In accordance to the study, fuel wood consumption in real terms is much higher than the recorded production of about 30%; thus, leaving a wide gap leading towards unsustainable extraction of fire wood. Moreover, on account of population pressure, demand for firewood has outstripped natural regeneration and planting, so much so that in some areas there is food to eat but not enough wood is available to cook it (Mathur, 1987)". The report also highlights the statistics from Forest Survey of India (FSI 1988:46) which estimated a gap of 130 million tonne between the demand and internal production of firewood in the country in 1987. The study also highlight demand for fuel-wood across Maharashtra in 1980 around 17 million cu. m. as against the production of 1.5 million cu. m. from the recorded forest (Pethiya & Luthra, 1991). The quoted demand supply gap of fire wood is also highlighted in the finding of the National Council for Applied Economic Research (NCAER).

State of Forest Report 1987 , MoEF, Govt. of India:

The report highlights gap between the demand and production of fire wood as major cause of deforestation. The reported consumption and production across the country within silviculturally permissible limit across the following years is indicated as follows –

| Year    | Consumption in million tonnes | Recorded Production in million tonnes                |
|---------|-------------------------------|------------------------------------------------------|
| 1953-54 | 86.3                          | 6.49                                                 |
| 1960-61 | 99.6                          | 8.15                                                 |
| 1965-66 | 109.3                         | 9.16                                                 |
| 1970-71 | 117.9                         | 11.62                                                |
| 1975-76 | 133.1                         | 19 m. from forest and 30 m. from tree outside Forest |

In accordance the gap between demand and production is met through pilferage leading to continuous depletion of forest land.

Wood Fuel Trade in India: Food and Agricultural Organisation of United Nation

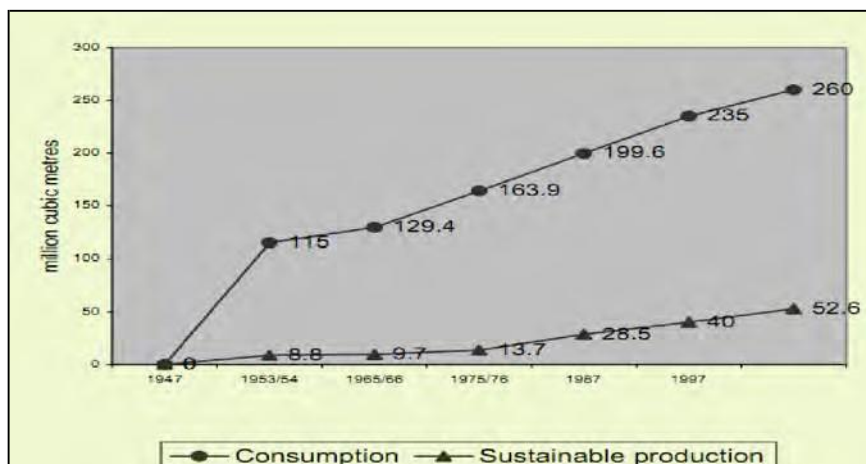
The report outlines demand- supply gap which has referred the expert committee report of MoEF dated 30.01.1998 as below –

| In million cubic metre |             |                        |       |
|------------------------|-------------|------------------------|-------|
| Year                   | Consumption | Sustainable Production | Gap   |
| 1953-54                | 115.0       | 8.8                    | 106.2 |
| 1965-66                | 163.9       | 13.7                   | 150.2 |
| In million cubic metre |             |                        |       |
| Year                   | Consumption | Sustainable Production | Gap   |
| 1975-76                | 199.6       | 28.5                   | 171.4 |
| 1987-88                | 235.0       | 40.0                   | 195.0 |

Rural energy data sources and estimations in India – TERI:

The report refers to gap between consumption and recorded production of fuel-wood has however increasing, indicating seriousness of the fuel-wood scarcity in India.

Fuel wood consumption and sustainable production since 1947



### Conclusion:

Therefore, it is established from the above studies that, a staggering gap exists between the demand and potential for sustainably extractable fuel wood from forest land. While the first three studies refer to the fuel wood supply scenario and the gap that were precedent before 1989; the study by TERI highlight the widening of gap between the demand and supply of biomass after 1989. The widening of the gap has been both due to the increased population pressure as well as the conversion of dense forest to medium dense, scrub and open type forest land due to unsustainable extraction even after the government's initiative towards promotion of afforestation. Thus, it can therefore be concluded that the gap exists from and before 1989 and continued thereafter, forcing the population in using biomass extracted in un- sustainable manner which is identified as non-renewable component.

As demonstrated above, the project activity satisfies qualifying criteria of the selected methodology AMS - II.G. Hence, the choice of the methodology is justified.

### 3.3 Project Boundary

According to the Paragraph 3 of approved methodology AMS-II.G., "The project boundary is the physical, geographical site of the efficient systems using biomass". The project boundary is therefore, encompasses physical, geographical sites of all 14,400 individual households possessing efficient cook stove in districts of Aurangabad, Jalna, Parbhani, Hingoli, Beed, Nanded, Osmanabad, Latur, Buldhana, Akola, Washim, Amravati, Yavatmal, Wardha, Nagpur, Bhandara, Chandrapur, Gadchiroli and Gondia of Aurangabad, Amravati and Nagpur Divisions, Maharashtra.. Based on the methodology, GHG included for the baseline and project scenario, leakage for the project activity is CO<sub>2</sub>.

| Source   |                                                                 | Gas              | Included? | Justification/Explanation                                                                         |
|----------|-----------------------------------------------------------------|------------------|-----------|---------------------------------------------------------------------------------------------------|
| Baseline | Emission combustion fuel wood traditional stove from of in cook | CO <sub>2</sub>  | Yes       | This is the major Green-house gas emitting from combustion of fuel wood in the baseline scenario. |
|          |                                                                 | CH <sub>4</sub>  | No        | Not Applicable as per the applicable methodology                                                  |
|          |                                                                 | N <sub>2</sub> O | No        | Not Applicable as per the applicable methodology                                                  |
| Project  | Emission from consumption of fuel wood in efficient cook stoves | CO <sub>2</sub>  | No        | Not Applicable as per the applicable methodology                                                  |
|          |                                                                 | CH <sub>4</sub>  | No        | Not Applicable as per the applicable methodology                                                  |
|          |                                                                 | N <sub>2</sub> O | No        | Not Applicable as per the applicable methodology                                                  |

| Source                   |                                                                                                                                         | Gas              | Included? | Justification/Explanation                                                                                         |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|-------------------------------------------------------------------------------------------------------------------|
| <b>Leakage Emissions</b> | Leakage related to the use/ diversion of non-renewable woody biomass saved under the project activity by non – project households/users | CO <sub>2</sub>  | Yes       | Baseline fuel wood consumption is multiplied by a net to gross adjustment factor of 0.95 to account for leakages. |
|                          |                                                                                                                                         | CH <sub>4</sub>  | No        | Not Applicable as per the applicable methodology                                                                  |
|                          |                                                                                                                                         | N <sub>2</sub> O | No        | Not Applicable as per the applicable methodology                                                                  |
|                          | Leakage related to if equipment utilised under the project activity is transferred from outside the boundary                            | CO <sub>2</sub>  | No        | Not Applicable as per the applicable methodology                                                                  |
|                          |                                                                                                                                         | CH <sub>4</sub>  | No        | Not Applicable as per the applicable methodology                                                                  |
|                          |                                                                                                                                         | N <sub>2</sub> O | No        | Not Applicable as per the applicable methodology                                                                  |

### 3.4 Baseline Scenario

Please refer to section B 4 of PDD of the UNFCCC registered CDM project reference no. 9434.

The web link of the same is given below:

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

### 3.5 Additionality

Please refer to section B 5 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

### 3.6 Methodology Deviations

Not Applicable, as there are no methodological deviations for this project activity.

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 4.1 Baseline Emissions

Please refer to section B 6.1 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

### 4.2 Project Emissions

Please refer to section B 6.1 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

### 4.3 Leakage

Please refer to section B 6.1 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

### 4.4 Net GHG Emission Reductions and Removals

Please refer to section B 6.4 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

| Year | Estimated baseline emissions | Estimated project emissions or | Estimated leakage | Estimated net GHG emission |
|------|------------------------------|--------------------------------|-------------------|----------------------------|
|------|------------------------------|--------------------------------|-------------------|----------------------------|

|                                  | or<br>removals<br>(tCO <sub>2</sub> e) | removals<br>(tCO <sub>2</sub> e) | emissions<br>(tCO <sub>2</sub> e) | reductions or<br>removals (tCO <sub>2</sub> e) |
|----------------------------------|----------------------------------------|----------------------------------|-----------------------------------|------------------------------------------------|
| Year 1 (06-10-2012 -05-10-2013)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 2 (06-10-2013 -05-10-2014)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 3 (06-10-2014 -05-10-2015)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 4 (06-10-2015 -05-10-2016)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 5 (06-10-2016 -05-10-2017)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 6 (06-10-2017 -05-10-2018)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 7 (06-10-2018 -05-10-2019)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 8 (06-10-2019 -05-10-2020)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 9 (06-10-2020 -05-10-2021)  | 13627                                  | 0                                | 682                               | 12945                                          |
| Year 10 (06-10-2021 -05-10-2022) | 13627                                  | 0                                | 682                               | 12945                                          |
| <b>Total</b>                     | <b>136,270</b>                         | <b>0</b>                         | <b>6820</b>                       | <b>129450</b>                                  |

## 5 MONITORING

### 5.1 Data and Parameters Available at Validation

Please refer to section B 6.2 of PDD of the UNFCCC registered CDM project with reference no. 9434.

The web link of the same is given below:

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

### 5.2 Data and Parameters Monitored

Please refer to section B.7.1 of PDD of the UNFCCC registered CDM project with reference no. 9434

The web link of the same is given below:

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

### 5.3 Monitoring Plan

Please refer to section B.7.3 of PDD of the UNFCCC registered CDM project with reference no. 9434

The web link of the same is given below:

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

# APPENDIX

*Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.*