# PANNA AFFORESTATION AND REFORESTATION PROJECT

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|---|---|
| Project title | Panna afforestation and reforestation project |
| Project ID | 4811 |
| Crediting period | 23-July-2023 to 22-July-2053 |
| Original date of issue | 20-September-2024 |
| Most recent date of issue | 20-September-2024 |
| Version | 1.0 |
| *VCS Standard* Version | 4.7 |
| Prepared by | CIP NBS Technical team |

# CONTENTS

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

The Panna Afforestation and Reforestation Project, (hereafter referred to as "the project") is a grouped Afforestation, Reforestation and Revegetation (ARR) project, planting a diverse range of native tree species on community and private land in Madhya Pradesh, India in partnership with local implementation partners and local communities.

The project targets a mix of large-scale afforestation and reforestation on areas of degraded community (Gram P*anchayat*) land and the plantation of economically beneficial trees in and around smallholder farmers' fields. Over the next 6 years, the project will plant over 11 million trees, comprising a mix of approximately 19 different native species, selected in consultation with communities and farmers, on an expected 19,000 hectares.

Climactic uncertainties over the years have made the region more fragile and aggravated issues of water and food scarcity. Against this backdrop, the Panna Project aims to improve the degraded lands through large scale afforestation that will impact not only the ecosystem of the region but will also positively address concerns of livelihood of the communities who are so closely dependent on this land.

Utilising Verra's innovative high integrity ARR methodology, VM00047, the Panna Project employs the area-based and census-based quantification methods and, where relevant, uses dynamic performance benchmarks and remote sensing to establish the project baseline and analyse additionality.

In addition to ARR activities, the project also involves the construction of water infrastructure facilities such as ponds, dams and community tanks to improve water availability, tree survival and local biodiversity. Water irrigation through borewells and solar pumps help to improve irrigation within the project area. The project also intends to support agricultural productivity gains and minimise amongst participating farmers through an extensive training program, focusing on concepts such as climate smart agriculture practises, zero tillage, and improved mulching.

A multi-faceted project that goes beyond carbon sequestration, the Panna Project also supports local livelihoods, improves food and water availability, sustainably raises agricultural yields, and positively impacts biodiversity across the project area. Through a community fund approach, the community members will benefit from a share of the carbon revenue as well as a multi-million dollar upfront funding commitment to improve education, healthcare and other aspects of life in the region.

The grouped project refers to first planting activity of 371,770 trees across approximately 591.5 hectares in the districts of Damoh, Panna, Katni and Chhatarpur, Madhya Pradesh. The first instance is anticipated to sequester approximately 151,899 tCO2e over a 30-year period, translating into approximately 5,063 tCO2e per year.

## 1.2 Audit History

| Audit type | Period | Program | Validation/verification body name | Number of years |
|---|---|---|---|---|
| *Validation* | Expected date[1]: November 2024 | VCS | Carbon Check (India) Private Limited | n.a. |

## 1.3 Sectoral Scope and Project Type

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|---|---|
| Sectoral scope | 14 |
| AFOLU project category[2] | ARR: Afforestation, Reforestation and Revegetation |
| Project activity type | Afforestation |

## 1.4 Project Eligibility

### 1.4.1 General eligibility

The project was designed in accordance with the VCS General Requirements listed in VCS Standard v4.7[3].

- The project is eligible under the scope of the VCS Program as the project includes AFOLU activities (project category Afforestation, Reforestation, Revegetation (ARR)) which are supported by a methodology approved under the VCS Program, namely VM0047 'Afforestation, Reforestation and Revegetation' v1.0. ARR activities are not excluded from Table 1, clause 2.1.3 of the VCS Standard.
- The project meets requirements related to the pipeline listing deadline. Pipeline listing has been initiated within three years of the project start date (23rd July 2023) and complies with this requirement. Validation is anticipated to take place within five years of the project start date and before the deadline of 23rd July 2028.

[1] As this project is presently under development, this section will be updated at the time of project validation.

[2] *See Appendix 1 of the* VCS Standard

[3] VERRA, 16 April 2024, VCS Standard v4.7, < https://verra.org/wp-content/uploads/2024/04/VCS-Standard-v4.7-FINAL-4.15.24.pdf>

- The applied methodology is VM0047 Afforestation, Reforestation, and Revegetation, v1.0 (VM0047 v1.0)[4] which is part of the VCS Program own methodologies approved for use[5]. This methodology does not have scale and/or capacity limits.

### 1.4.2 AFOLU project eligibility

- The project seeks to increase carbon sequestration by establishing vegetative cover through the planting of native tree species on community and private land. As such, it falls under the "Afforestation, Reforestation and Revegetation (ARR)" AFOLU project category. The category requirements are listed in the VCS Standard v4.7:

| Section | Eligibility condition | Compliance | Justification of compliance |
|---|---|---|---|
| 3.2.2 | Where projects are located within a jurisdiction covered by a jurisdictional REDD+ program, project proponents shall follow the requirements in this document and the requirements related to nested projects set out in the Jurisdictional and Nested REDD+ Requirements. | Yes | There is no jurisdictional REDD+ program in India (see VERRA JNR registry[6], Architecture for REDD+ Transactions database[7], Forest Carbon Partnership Facility[8]) |
| 3.2.3 | Where an implementation partner is acting in partnership with the project proponent, the implementation partner shall be identified in the project description. The implementation partner shall identify its roles and responsibilities with respect to the project, including but not limited to implementation, management, and monitoring of the project, over the project crediting period. | Yes | The implementation partner is identified in Section 1.7. below. |

[4] VCS, 28 September 2023, VM0047 Afforestation, Reforestation and Revegetation version 1.0, < https://verra.org/wp-content/uploads/2023/09/VM0047_ARR_v1.0-1.pdf>

[5] Please refer to VERRA / VCS methodologies page < https://verra.org/methodologies-main/#vcs-program-methodologies>

[6] <https://registry.verra.org/app/search/JNR/All%20Projects>

[7] <https://art.apx.com/myModule/rpt/myrpt.asp?r=111>

[8] <https://www.forestcarbonpartnership.org/countries>

| | | | |
|---|---|---|---|
| 3.2.8 | Where ARR, ALM, IFM or REDD project activities occur on wetlands, the project shall adhere to both the respective project category requirements and the WRC requirements, unless the expected emissions from the soil organic carbon pool or change in the soil organic carbon pool in the project scenario is deemed below de minimis or can be conservatively excluded as set out in the VCS Methodology Requirements, in which case the project shall not be subject to the WRC requirements. | Yes | Project activities do not occur on wetlands, as determined by soil maps, wetland maps, and topographical information to rule out wetland areas. |
| 3.2.10 | Projects shall prepare a non-permanence risk report in accordance with the AFOLU Non-Permanence Risk Tool at validation and verification. The non-permanence risk report shall be prepared using the AFOLU Non-Permanence Risk Assessment Calculator and shall be included as an annex to the project description or monitoring report, as applicable, or provided as a stand-alone document. | Yes | The non-permanence risk report will be submitted to the VVB at validation as per the registration and issuance process[9]. |
| 3.2.11 | Projects shall have a minimum of a 40-year project longevity. | Yes | The project activities will be maintained for at least 40 years. |
| 3.2.12 | Projects with tree harvesting shall demonstrate that the permanence of their carbon stock is maintained and shall put in place management systems to ensure the carbon against which VCUs are issued is not lost during a final cut with no subsequent replanting or regeneration. Post-harvest replanting and subsequent harvest plans shall be included in a | Yes | Timber harvesting is not anticipated for the project. Community consultations have determined that private landowners and community leaders do not intend to harvest any trees over the project lifetime. |

[9] VCS, 4 October 2023, Registration and Issuance process, <https://verra.org/wp-content/uploads/2023/08/Registration-and-Issuance-Process-v4.4-last-updated-4-Oct-2023.pdf>

| | | | |
|---|---|---|---|
| | government- or professional forester-approved forest management plan. | | |
| 3.2.24 | The permanence of carbon stocks shall be monitored for a minimum of 40 years. | Yes | The carbon stocks will be monitored for a minimum of 40 years. |
| A.1.1 | Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing, or restoring vegetative cover (forest or non-forest) through the planting, sowing, or human-assisted natural regeneration of woody vegetation. Eligible ARR projects may include timber harvesting in their management plan. | Yes | The project involves direct planting of native tree seedlings on non-forested land which will restore vegetative cover. |

The applied methodology is VM0047 v1.0 which is part of the VCS Program own methodologies approved for use. Consequently, the project also complies with the VCS Methodology Requirements v4.4[10].

- Evidence that native ecosystems have not been converted, cleared, drained, or degraded to generate GHG credits will be provided in Section 2.4.3 below.
- Evidence that clearing or conversion did not take place within 10 years of the project start date will be provided in Section 2.4.3 below.

### 1.4.3 Transfer project eligibility

The current project is not a part of any other project or CPA registered under another GHG program hence the not applicable and it meets the eligibility criteria for the transfer project and CPAs seeking registration under the VCS Program.

## 1.5 Project Design

☐ Single location or installation

☐ Multiple locations or project activity instances (but not a grouped project)

☒ Grouped project

### 1.5.1 Grouped project design

[10] VERRA, 4 October 2023, VCS Methodology Requirements v4.4, < https://verra.org/wp-content/uploads/2023/08/VCS-Methodology-Requirements-v4.4-updated-4-Oct-2023.pdf>

The first project activity instance, comprising of approximately 371,770 trees across 591.5 ha has been implemented in the districts of Chhatarpur, Panna, Katni and Damoh in the State of Madhya Pradesh. Additional Project Activity Instances (PAIs) will be added in these or other target district as the project scales up and participating communities are identified and enrolled in line with the instance criteria set out below.

In addition to the general eligibility criteria, AFOLU-specific criteria, and ARR-specific criteria described above, additional PAIs will, at a minimum:

- Be located within the State of Madhya Pradesh (land parcels that straddle two States including Madhya Pradesh are also considered as eligible)
- Have the same land ownership structures as defined in Section 1.8;
- Have similar policy environments to the initial project instance;
- Implement and plant the same plantation models as the initial project instance;
- Have not been subject to clearing or conversion of native ecosystems in the 10 years prior to inclusion in the project, as set out in Section 3.19.29 of the VCS Standard;
- Undertake the delineation of project boundary, identification of pre-project scenario, account for leakage and estimate performance benchmark in an identical method to the initial project sites, for PAIs using the area-based accounting approach; and
- Have other characteristics that match the existing project instances, with respect to the factors determining the donor pool area (table A1 in VM0047), for new PAIs that will use the area-based accounting approach.

Implementing partners will be:

- Any entity working with local farmers or community lands, for example:
    - A community-based organization with on-going participatory processes (general assembly, elections at least) such as cooperatives, farmers associations, community associations, Non-Government Organizations (NGOs), and Indigenous communities.

## 1.6 Project Proponent

| | |
|---|---|
| **Organization name** | Climate Impact Partners Limited |
| **Contact person** | Rachael Nutter |
| **Title** | Global Director Project Development |
| **Address** | 112 Magdalen Road, Oxford, Oxfordshire, England, OX4 1RQ |
| **Telephone** | +44 (0)1865 591000 |
| **Email** | rachael.nutter@climateimpact.com |

## 1.7 Other Entities Involved in the Project

| | |
|---|---|
| **Organization name** | Haritika Eco Solutions |
| **Role in the project** | Ground Implementing Partner |
| **Contact person** | Avani Mohan Singh |
| **Title** | Founder |
| **Address** | Gwalior Road, Behind Govt. Girls Polytechnic, Mahendra Puri, Jhansi, (UP). 284003 |
| **Telephone** | +91-9516614021 |
| **Email** | avanimohansingh@haritika.org |

In addition to the project proponent, ground implementing partners such as those named above also have an implementation role in the project. To date, Haritika has been responsible for overseeing implementation in the first instance. The responsibilities of the implementing partner include (a) management of stakeholder engagement and the Free and Prior Informed Consent (FPIC) process with farmers and communities, (b) organization and management of land preparation and planting teams, (c) supervision of maintenance activities.

It is anticipated that more implementation partners may be recruited as the project expands into new areas.

## 1.8 Ownership

Carbon credits fall within the meaning of "intangible movable goods" under Indian Law. As a consequence, landowners are considered the de facto owners of the carbon assets which can be transferred through a carbon waiver.

The first Project Activity Instance (PAI) of the project incorporates planting on both private land and community (Gram Panchayat) land. In both cases project ownership will be demonstrated by 1) evidence of clear land title documentation in the form of a *Khasra* record, the official land ownership documentation for the State of Madhya Pradesh and 2) the signature of a carbon waiver by the rightful owner or authorised representative. In the case of community (Gram Panchayat) land, resolutions will be signed by duly authorised representatives from the Gram Panchayat.

**Land tenure classes**

The project has identified 3 land tenure classes that may be included in the project and future instances - note that other land tenure type may be incorporated to the new PAI in the future based on a legal advice. These are outlined in the table below.

| Type of land | Landowner | Explanation |
|---|---|---|
| Private land | Landowner not belonging to Scheduled Caste/Scheduled Tribe (SC/ST) | These are private land parcels where the landowner is an individual farmer. |
| Private land | Landowner belonging to SC/ST tribe | These are land parcels where the landowner is an individual belonging to a Schedule Caste or Scheduled Tribe, as defined by the Government. In these cases, some restrictions exist on the ability of these lands to be sold to non-SC/ST individuals. |
| Community land | Government of Madhya Pradesh | These are land parcels where the landowner is the Government of Madhya Pradesh but the land is entrusted to the village/community as common land The ownership document remains a Khasra record. |

**Table 1: Summary of land parcels**

### Land verification and carbon waiver procedures

The proponent establishes project ownership using a legally appropriate carbon waiver agreement executed directly between the proponent and legal land owner or representative of the planting sites after the completion of the stakeholder consultation process. The carbon waiver ascribes full ownership of the carbon rights to the project proponent and is transferable upon any changes in land ownership. The carbon waiver was designed in conjunction with local legal counsel and international legal counsel to provide clarity to all parties, and also ensure the community and land owner has clear rights and benefits as part of the project.

The structure of the carbon waiver documentation is designed in two components;

1. Carbon Rights Agreement: This agreement details out the transfer of any environmental attributes, the project and purpose, the responsibilities of the parties, the benefits to the land owner as well as the grievance process and other key terms.
2. Schedule: The schedule outlines additional terms to provide clarity for to the signatory, and acts as a terms and conditions to supplement the Carbon Rights Agreement.

The Carbon Rights Agreement is signed by the applicable land owner or party and the beneficiary of the right to the environmental attributes ("Beneficiary"). For the 2023 and 2024 planting, the beneficiary was Climate Impact Partners. For future years, the project may opt to operate this Carbon Rights Agreement under an India-based Special Purpose Vehicle. Any assignment of carbon rights following signature of the carbon waiver will be notified to the land owner following best practise.

For private land, the signatory is the named owner on the *Khasra* record while for community land, the signatory is the village head/authorised representative of the *Gram Panchayat*, capable of executing any documents on behalf of the community.

In both cases, each carbon agreement is signed on official 'India non-judicial' paper and stamp duty paid. Each agreement is stored physically as well as electronically. Signature or thumb print is acceptable, with identification of land owner provided based upon legal guidelines.

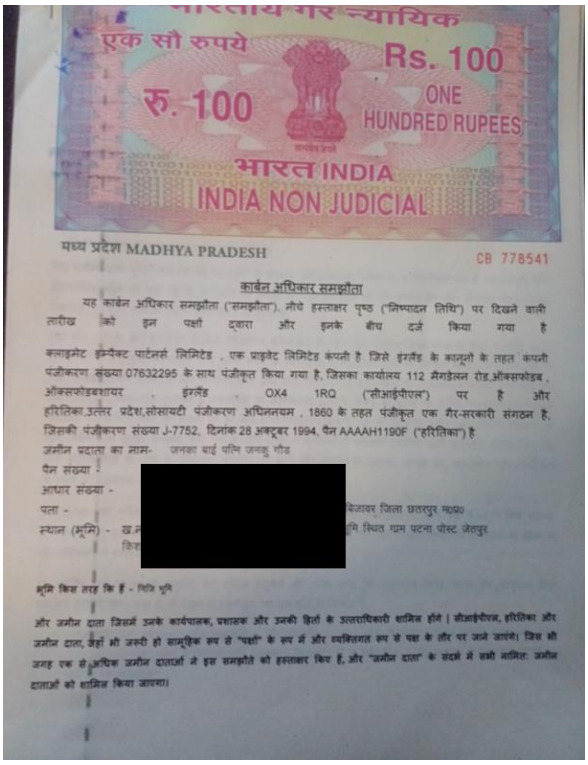


**Figure 1: Example of notarized carbon waiver from the first project instance**

Land ownership for both Gram Panchayat and private land is verified via the confirmation of a land tenure document known as a *Khasra* number in Madya Pradesh. Copies of the *Khasra* records are collected electronically from participating landowners as part of project enrolment and then cross-referenced online on the Madya Pradesh Land registry website, known as the MP Bhulekh portal. In cases where there are encumbrances or legal ambiguity over land ownership, additional confirmations are sought from the *Sarpanch* (village head) or *Patwari* (community record keeper) prior to site inclusion in the project.

| Phase 1: Sensitization Activities | | | | |
|---|---|---|---|---|
| Review secondary records (and Patwari records). | Collect Khasra numbers from farmers/Patwari | Collect Khasra numbers from farmers/Patwari | Physical verification of land parcels | Discussions with Panchayat on community land availability |

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| Phase 2 - Verification of land ownership (Community and private) | | |
|---|---|---|
| 1. Verified on Bhhulek website (https://mpbhulekh.gov.in/mpbhulekh.do), if no match then step 2. | 2. Land record is taken from the Patwari records, if no match then step 3. | 3. Land Record obtained from Revenue Department, if no match, land is ineligible for planting. |

↓

| Phase 3 - Agreement and carbon waiver signing | |
|---|---|
| **Community (Panchayat Land)** | **Private Land** |
| 1. Gram Sabha meeting - Details of the carbon project discussed and noted in Gram Sabha minutes. 60% minimum attendance<br>2. Gram Panchayat resolution signed by Sarpanch and Gram Panchayat Secretary including project details, duration, site.<br>3. Carbon Waiver and Schedule are signed the Sarpanch and Gram Panchayat Secretary<br><br>ID captured | 1. Landowner signs Carbon Waiver and Schedule<br>2. ID captured |

**Figure 2: Overview of land verification and carbon waiver process**

## 1.9 Project Start Date

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|---|---|
| **Project start date** | 23-Jul-2023 |
| **Justification** | As per the VCS Program Definitions[11], "the start date of an AFOLU project or jurisdictional REDD+ program is the date on which activities that led to the generation of GHG emission reductions or removals are implemented (e.g., planting, changing agricultural or forestry practices, rewetting, restoring hydrological functions, or implementing management or protection plans)".<br><br>For the Panna afforestation project, it corresponds to planting. |

## 1.10 Project Crediting Period

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|---|---|
| **Crediting period** | ☐ *Seven years, twice renewable*<br><br>☐ *Ten years, fixed*<br><br>☒ *Other (The crediting period is 30 years renewable in accordance with the VCS standard 4.7 section 3.9.3)* |
| **Start and end date of first or fixed crediting period** | 23-Jul-2023 to 22-July-2053 |

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

☒ < 300,000 tCO2e/year (project)

☐ ≥ 300,000 tCO2e/year (large project)

The following GHG emission removals are a provisional estimate that corresponds to approximately 371,770 or 591.5 hectares of trees planted as part of the initial project activity instance. The buffer has not been factored in.

[11] VCS, 16 April 2024, Program Definitions, <https://verra.org/wp-content/uploads/2024/04/VCS-Program-Definitions-v4.5-FINAL-4.15.24.pdf>

| Calendar year of crediting period | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 23-Jul-2023 to 31-December-2023 | -248 |
| 01-January-2024 to 31-December-2024 | 843 |
| 01-January-2025 to 31-December-2025 | 1 587 |
| 01-January-2026 to 31-December-2026 | 5 616 |
| 01-January-2027 to 31-December-2027 | 1 085 |
| 01-January-2028 to 31-December-2028 | 5 304 |
| 01-January-2029 to 31-December-2029 | 4 136 |
| 01-January-2030 to 31-December-2030 | 4 659 |
| 01-January-2031 to 31-December-2031 | 5 344 |
| 01-January-2032 to 31-December-2032 | 5 787 |
| 01-January-2033 to 31-December-2033 | 6 248 |
| 01-January-2034 to 31-December-2034 | 6 859 |
| 01-January-2035 to 31-December-2035 | 7 316 |
| 01-January-2036 to 31-December-2036 | 7 718 |
| 01-January-2037 to 31-December-2037 | 8 090 |
| 01-January-2038 to 31-December-2038 | 7 777 |
| 01-January-2039 to 31-December-2039 | 8 069 |
| 01-January-2040 to 31-December-2040 | 8 631 |
| 01-January-2041 to 31-December-2041 | 8 799 |
| 01-January-2042 to 31-December-2042 | 6 779 |
| 01-January-2043 to 31-December-2043 | 4 009 |
| 01-January-2044 to 31-December-2044 | 4 390 |
| 01-January-2045 to 31-December-2045 | 4 316 |
| 01-January-2046 to 31-December-2046 | 4 259 |
| 01-January-2047 to 31-December-2047 | 4 208 |
| 01-January-2048 to 31-December-2048 | 4 732 |
| 01-January-2049 to 31-December-2049 | 3 857 |

| | |
|---|---|
| 01-January-2050 to 31-December-2050 | 3 905 |
| 01-January-2051 to 31-December-2051 | 3 904 |
| 01-January-2052 to 31-December-2052 | 3 919 |
| **Total estimated ERRs during the first or fixed crediting period** | 151 899 |
| **Total number of years** | 30 |
| **Average annual ERRs** | 5 063 |

## 1.12 Description of the Project Activity

- The Panna project is not located within a jurisdiction covered by a jurisdictional REDD+ project.
- The Panna Project is comprised of multiple instances of ARR activities in the form of direct planting of multiple native species across 6 distinct planting models on community and private land.

### 1.12.1 Planting models

An overview of the planting models is provided in the table below (they may change slightly over the life of the project).

| Model | Description | Land type | Planting type | Pre-project land use | Post-project land use | Density (trees/ha) |
|---|---|---|---|---|---|---|
| AF1a | Horticulture and fruit-bearing trees | Private agricultural land | In-field (intercrop) | Agricultural production | Agricultural production | 250 |
| AF1b | Horticulture and fruit-bearing trees | Private agricultural land & Community Land | In-field (full stand) | Agricultural production<br>Degraded barren land | Fruit orchard<br>Fruit orchard | 750 |
| AF2a | Timber and commercial tree species. | Private agricultural land | Boundary planting | Agricultural production | Agricultural production | 120 |
| AF2b | Timber and commercial tree species. | Community land | Full stand | Barren land with some | Forest cover | 750 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | individual trees | | |
| AF3 | Medicinal tree species with various benefits. | Community land | Full stand | Degraded barren land | Forest cover | 750 |
| AF4 | Agroforestry species providing non-timber forest products | Community land | Full stand | Degraded barren land | Forest cover | 750 |

**Table 2: Overview of planting models**

### 1.12.2 Tree species

The selected tree species are outlined below, and include a diverse mix of fruit-bearing trees, commercial trees, medicinal trees, and other non-timber forest produce (NTFP) species. Species below are the ones planted in PAI1 and may evolve over the lifetime of the project.

| Models 1a & 1b | Models 2a & 2b | Model 3 | Model 4 |
|---|---|---|---|
| Guava<br>*Psidium guajava* | Khameer<br>*Gmelina arborea* | Peepal<br>*Ficus religiosa* | Jamun<br>*Syzygium Cumini* |
| Aaonla<br>*Phyllanthus emblica* | Sheesham<br>*Dalbergia sissoo* | Bargad<br>*Ficus Benghalensis* | Sitafal<br>*Annona squamosa* |
| Mango<br>*Mangifera indica* | Neem<br>*Azadirachta indica* | Semal<br>*Bombax ceiba* | Tendu<br>*Diospyros melanoxylon* |
| Kinnow<br>*Citrus nobilis* | Teak<br>*Tectona grandis* | Molshree<br>*Mimusops elengi* | Mahua<br>*Madhuca longifolia* |
| Jackfruit<br>*Artocarpus heterophyllus* | | | Aaonla<br>*Phyllanthus emblica* |
| Bael<br>*Aegle marmelos* | | | |

**Table 3: Species mix per planting model**

### 1.12.3 Indicative planting schedule

An indicative planting schedule is provided below. Note that it may evolve over time to reflect the operational reality of the project.

| Year | Hectares | Target trees |
|---|---|---|
| 2023 | 591 | 371,771 |
| 2024 | 1,340 | 828,230 |
| 2025 | 3,000 | 1,791,457 |

| | | |
|---|---|---|
| 2026 | 4,805 | 2,869,344 |
| 2027 | 4,805 | 2,869,344 |
| 2028 | 4,805 | 2,869,344 |
| **Total** | **19,082** | **11,599,792** |

**Table 4: Anticipated planting schedule by year**

All the trees planted in a given year are part of the same "planting wave" (e.g. trees planted in year 2023 are from planting wave 2023).

### 1.12.4 Implementation schedule of project activities

For each planting wave, the sequence of activities is divided as follows:

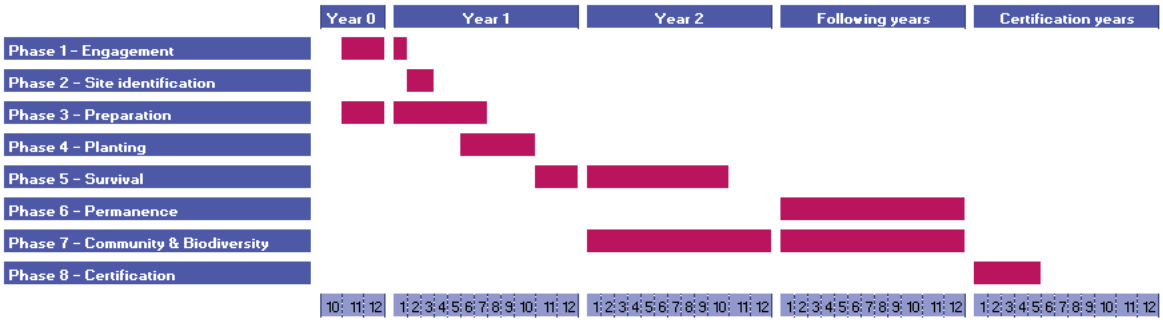



**Figure 3: Implementation schedule of project activities for each planting wave**

The following sections provide further details on the key activities implemented by the project.

#### Phase 1 – Engagement

Local Stakeholders Consultations are conducted at district level between November and December of year n-1 for planting wave n. In parallel, several socializations are conducted at village level to allow broad participation of all stakeholders. This engagement process ensures that all relevant stakeholders have been properly informed and consulted on their willingness to participate in the project, the project objective and design, carbon benefit sharing and any other relevant aspect of the project.

**Figure 4: Socialization in Achalpura**

### Phase 2 – Site identification

*Land identification*

Site identification is based on ongoing dialogue with private land owners, Gram Panchayat representatives and community members which leads to the compilation of a preliminary list of interested private owners and communities with their land characteristics.

A pre-planting survey is conducted to confirm the characteristics of the land parcels (owner or authorised representative name, location, area), understand pre-planting condition of each planting site and planting objectives, which will determine the planting models and species to be planted.

For community lands, resolutions and carbon waivers are signed by the community decision-making body (*Gram Panchayat*) to execute the project on the selected land. They include details such as the location for planting (including *Khasra* number), duration of the project and are signed by the Sarpanch and Gram Panchayat Secretary. The minutes from the traditional community meetings (known as *Gram Sabha*[12]) meeting are also collected as evidence of community discussion.

For private land, the relevant landowners sign individual carbon waivers to join the project. The project also reviews and validates land records as part of this step. For more information on the stakeholder consultation and participation processes, please see Section 2.1 of this PDD.

*Water harvesting structure (WHS) site identification*

In addition to the afforestation activities, project activities also include the construction of water conservation structures designed to increase the water catchment area and bolster groundwater levels to support tree survival and growth, which in turn will reduce water vulnerability and support sustainable agricultural practices within the local communities. Site identification for WHS is based on ongoing dialogue with Gram Panchayat representatives and community members. Resolutions are signed by the community decision-making body (*Gram Panchayat*) to execute the project on the selected land.

### Phase 3 – Preparation

*Seedling supply*

From April, seedlings orders are placed with Private owned and Government nurseries based on operational needs and seedlings availability. The project also involves the establishment of one or several nurseries to be run by implementation partners. One nursery has already been established in 2024. The objective is first and foremost to secure supplies for the project, both in quantity and quality, and ensure flexibility for gap filling or replenishing land parcels to maximise survival rate but the activity could be

[12] The traditional community decision making structure outlined in the 'Provisions of the Panchayats (Extension to Schedule Areas) Act, 1996' which endowes Panchayats with power and authority over a number of functions include: Minor Forest product, Social Forestry, Land Management, amongst others.

sustained in the future by the implementing partner for the benefit of the neighbouring communities or other reforestation initiatives.

*Site preparation*

Site preparation activities are carried out from April. They include fencing of community land, erection of signs explaining the planting activities, pit digging using local machinery, the creation of irrigation system and the installation of drip irrigation where required. For pit digging, lines are marked out using marked rope and pits are dug at a spacing depending on the planting model. Compost and vermicompost (organic and sourced locally), Neem Oil Cake and *Agadi* (Termite control), is added to each planting pit at a quantity of approximately 100g compost, 100g Neem Oil Cake and 10g *Agadi* per pit to support early stage seedling growth. Site preparation is done by paid community members on community lands and by participating farmers on private lands, under the guidance of implementation partner staff.

**Figure 5: Fenced plantation site at Malguwan village, Shahnagar block, Panna District**

*WHS site installation and water conservation structures*

WHS sites and water conservation structures will be constructed or renovated to support plantation activities across each project activity instance. These include: i) community tanks; ii) check dams, iii) farm ponds iv) gabion structures and dug wells, v) field bundings and vi) boreholes utilising a mix of electricity and solar pumps.

- Small check dams with a capacity of 8-10 million litres each are constructed or rehabilitated in 8 locations across the project area. These dams are installed in strategic locations close to community planting sites across seasonal streams in order to capture monsoon rains and recharge groundwater levels. This, ensures a more consistent water supply during the critical Rabi season for farmers, thereby enhancing agricultural productivity. During project implementation existing check dams have also been repaired to provide consistent water supply to nearby planting sites and local farmers.

- Community tanks or ponds are utilised to capture rainwater runoff and expand the water catchment area. Community tanks will be constructed to serve as vital water storage reservoirs, improving water availability for all stakeholders.
- Gabion structures and dug wells – Dug wells provide direct access to groundwater for irrigation purposes, while gabion structures aid in soil retention and moisture retention, further contributing to improved soil health and crop productivity.
- Field bunding – field bundings will be constructed where necessary around the boundaries of smallholder farmer plots. This technique involves constructing small soil embankments along field contour lines, effectively reducing soil erosion, retaining moisture, and enhancing water infiltration. As a result, soil health improves, and crop productivity increases.
- Borewells with solar and electric pumps – The project's commitment to sustainable water management extends to the construction of bore wells equipped with solar pumping systems. These innovative systems harness solar energy to pump water from underground sources, providing a reliable and eco-friendly water supply to our plantation sites.

**Figure 6: Repaired check dam in Kupiya village, Bijawar**


**Figure 7: Pond under construction in Kupiya village, Bijawar block, Chhatarpur District**

### Phase 4 – Planting

Planting is done throughout the South-Western monsoon season in the project area, which typically arrives in mid-July and continues until early October each year. Planting is done by paid community members, overseen by staff of the implementation partners to ensure planting protocols are observed.

#### Phase 5 – Survival and Phase 6 - Permanence

Seedling maintenance commences following planting and includes de-weeding, maintenance of drip irrigation, mulching, maintenance of fences and notice boards, and pruning where applicable. Data will be collected from the field to monitor maintenance activities and trees loss at least throughout the project longevity. Gap filling will be done throughout the South-Western monsoon season in the project area, between mid-July and October each year when appropriate.

#### Phase 7 – Community and Biodiversity

The project intends to promote sustainable agricultural practices that enhance crop production, improve soil quality, and reduce the environmental impact of farming. These activities will act as leakage mitigation activities that enhance agricultural production for participating farmers on their other, existing agricultural land parcels, in line with VMD0054, Module for Estimating Leakage from ARR Activities. A detailed plan for implementing these activities will be made available by Q4 2025. Examples of these activities are described below.

*Natural Manure Pest Management (NMPM) Centres:*

The Panna project takes a holistic approach to sustainable agriculture by establishing Natural Manure Pest Management Centres in the project area. These Centres serve as hubs for producing and distributing organic fertilizer and bio-stimulants such as *Neemastra*. These Centres will provide demonstration sites and training for participating farmers who can then harness these techniques at home, apply the products on their existing farms, and significantly improve production and enrich soil quality.

*Zero Budget Natural Farming:*

A core element of the project's agricultural practices is the promotion of zero budget natural farming. This approach emphasizes the use of locally available resources and organic inputs, minimizing external inputs and expenses for farmers. It aligns with the project's mission to create economically sustainable and provide training throughout the project cycle on sustainable agricultural practices including zero tillage for improved crop production.

#### Phase 8 – Certification

During the preparation for every verification event, biomass inventories will be carried out and training on VCS certification and biomass inventories will be provided to involved staff and all relevant stakeholders.

### 1.12.5 Description of organization involved

The project involves the engagement of various stakeholders and organizations, including the project proponent, implementing partners, Gram Panchayats, participating farmers. Each entity has specific roles and responsibilities within the project:

### Project proponent:

Climate Impact Partners (CIP) is the principal and sole project proponent, and is responsible for ensuring operational success of the project and providing technical support to implementation partners. CIP is acting as the project develop and is responsible for the development of the PDD, designing the monitoring plan, and overall implementation protocols aligned with carbon standards and internal best practice.

Climate Impact Partners is a specialist in carbon market solutions, turning its clients' ambitions into impact. Operating internationally since 1997, it has partnered with climate-leading companies and organizations to develop, finance, and support projects that reduce carbon emissions, improve health and livelihoods, and protect and restore biodiversity. Climate Impact Partner's global team continues to pioneer the market's growth and set the standards for quality.

### Implementing partners:

Implementing partners, for example Haritika, are responsible for executing pre and post-plantation activities at a community level to ensure the successful establishment and maintenance of trees. Implementing partners are also responsible for community engagement, management of the stakeholder consultation process, land and farmer registration, and ongoing maintenance activities. In addition, implementation partners are responsible for promoting sustainable agricultural practices and also identify sites, contract and oversee construction of water conservation structures, which play a vital role in maintaining adequate water supply for the plantations.

### Gram Panchayat:

*Gram Panchayat*s, the village-level decision-making body within communities, play a crucial role in the project by actively engaging in pre and post plantation activities. Their responsibilities include: mobilisation for sustainable agricultural practices activities, support the monitoring of plantation activities by assisting the Community Resource Persons (CRPs). Gram Panchayat members are also responsible for ensuring community adherence to the stipulations of the carbon waiver.

### Farmers and community members

Private land owners and community members will play an active role in ensuring the continuous improvement of the project design and the implementation of the project activities, including the design of the "sustainable agricultural practices activities". Private land owners will be responsible for all the planting and maintenance activities on their land and the monitoring of plantation activities by assisting the Community Resource Persons (CRPs). They will be the owners of the trees and all non-timber forest products produced on their land. Community members will also help support the community land parcels (including as casual workers paid by the project), and be able to utilise the produce from the trees.

## 1.13 Project Location

The project will be implemented in the State of Madhya Pradesh, India. The first Project Activity Instance is located within the Chhatarpur, Damoh, Katni and Panna districts (23° 50' 20.5944" N; 79° 26' 27.6900" E). Precise location of every planting site is available in the shared KML file.

## 1.14 Conditions Prior to Project Initiation

**Ecosystem type**

Madhya Pradesh is covered by 5 agro-ecological zones: (1) the Central Highlands (Malwa and Bundelkhand) hot subhumid eco-region, (2) the Chattisgarh/Mahanadi Basin Agro-eco-region, (3) the Central (Malwa) Highlands, Gujarat plains and Kathiawar Peninsula Ecoregion, (4) the Northern Plain (and Central Highlands) including Aravallis, hot semi-arid ecoregion and the (5) Deccan Plateau, hot semi-arid eco-region[13].

**Pre-project land use**

The project area consists of two main land use/ land cover types which are highly correlated to the land tenure type:

- Gram Panchayat community lands are covered by broadly degraded barren lands consisting of degraded poor quality grassland interspersed with occasional shrubs and very few mature trees. The use of these lands by communities is very limited.


**Figure 8: Pre-planting land use and land cover on community land (planting site 240099 in Riyana, Damoh)**

- Private lands are used for growing annual rain-fed crops during the Kharif (from June-July to October-November) and Rabi (October-November to March) seasons. No crop is grown during the Zaid (March- April to June) season due to the lack of irrigation.

[13] Gajbhiye K.S. and Mandal C., 2000, Agro-Ecological Zones, their soil resource and cropping systems, < https://krishi.icar.gov.in/jspui/bitstream/123456789/32452/1/Tree-based%20farming%20systems%20for%20different%20agro-eco-sub%20regions%20of%20Andhra%20Pradesh.pdf>

**Figure 9: Pre-planting land use and land cover on private land (planting site 240048 in Gulat, Bijawar)**

The purpose of the project is to ensure that livelihoods, food security and quality of life of households are sustainably improved and that their vulnerability to climate change and broad environment degradation is reduced by restoring and enhancing the eco-environmental services from forests, agroforestry and trees.

### Present and prior environmental conditions of the project area

#### Climate

Madhya Pradesh has a subtropical climate with three distinct seasons: winter season (Dec-Feb), summer season (Mar – May), and rainy season (June – Oct). Note that the rainy season will be used as the annual planting period for the project. It faces large temperature swings with minimum temperatures in winter around 10°C and summer temperatures that can reach up to 48°C. The State receives an average annual rainfall of 1,160 mm, mostly during the rainy season[14].

[14] Climate and Development knowledge network, 2013, Madhya Pradesh State Action Plan on Climate Change. Briefing note on the climate science of Madhya Pradesh, < https://cdkn.org/sites/default/files/files/MP_CLIMATE-SCIENCEBrief_Final_LR.pdf>

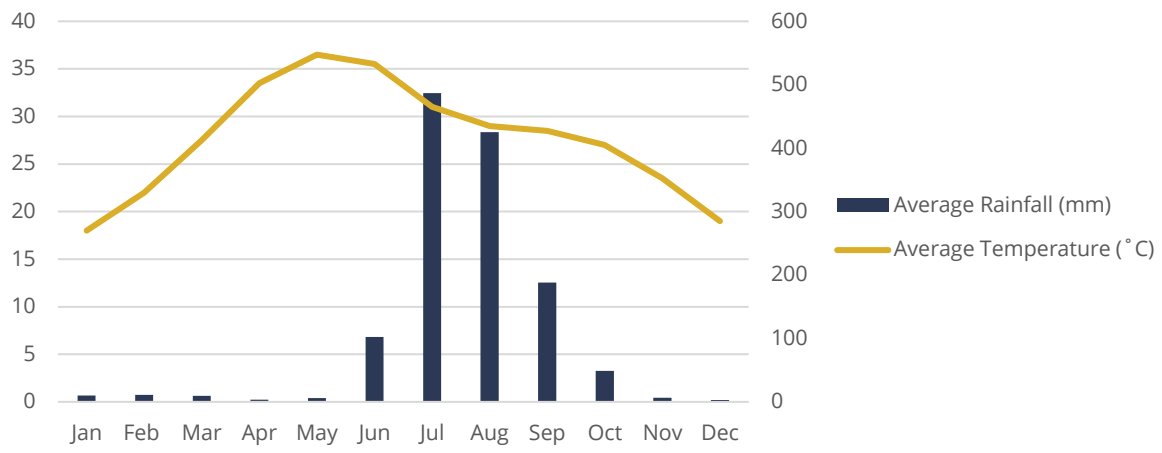



**Figure 10: Annual rainfall and temperature by month[15]**

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rain Days | 1 | 1 | 0 | 0 | 0 | 3 | 15 | 16 | 9 | 2 | 0 | 0 |

**Table 5: Rain days per month**

[15] www.worldweatheronline.com/panna-weather-averages

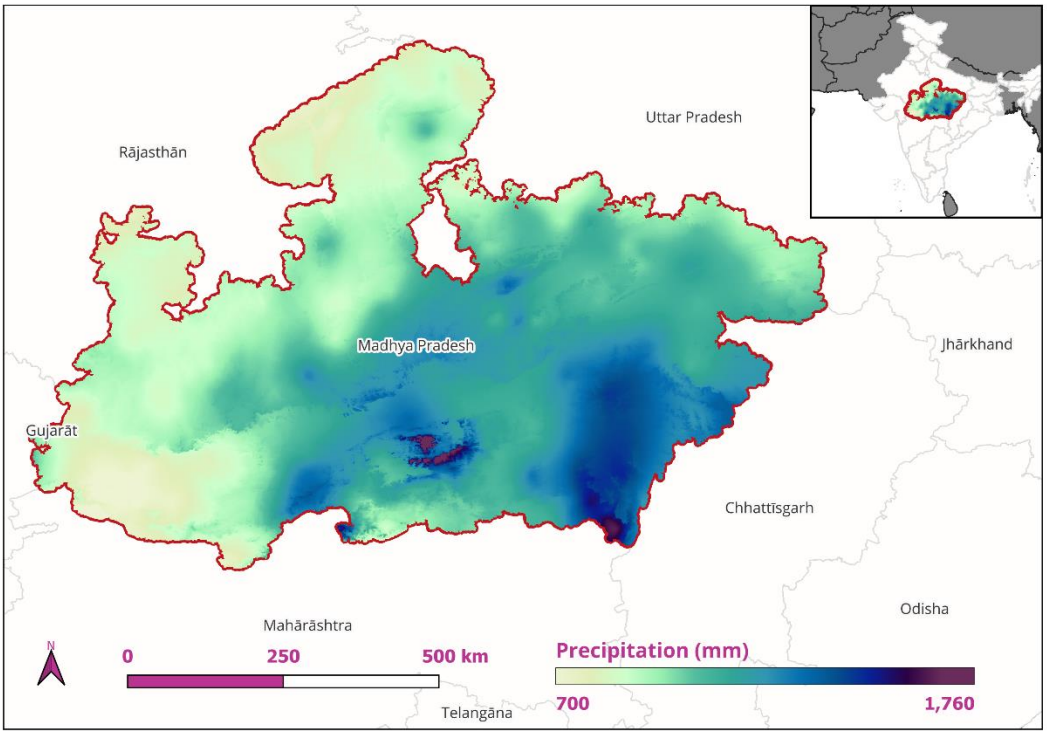



**Figure 11: Average annual precipitation within geographical area, Madhya Pradesh[16]**

### Hydrology

There are 6 river basins in Madhya Pradesh: (1) Ganga Basin, (2) Narmada Basin, (3) Godavari Basin, (4) Tapti Basin, (5) Mahi Basin and (6) Mahanadi Basin. The main source of ground water recharge is rainfall and the total annual extractable ground water resource is 32.85 bcm in 2023, which could be increased or more sustainably used by the implementation of water conservation structures[17].

[16] WorldClim BIO Variables V1, developed by Robert J. Hijmans, Susan Cameron, and Juan Parra, at the Museum of Vertebrate Zoology, University of California, Berkeley, in collaboration with Peter Jones and Andrew Jarvis (CIAT), and with Karen Richardson (Rainforest CRC), https://developers.google.com/earth-engine/datasets/catalog/WORLDCLIM_V1_BIO#description

[17] Government of India and Government of Madhya Pradesh, 2023, Dynamic ground water resources of Madhya Pradesh, < https://www.cgwb.gov.in/cgwbpnm/public/uploads/documents/17084171551904353 08file.pdf>

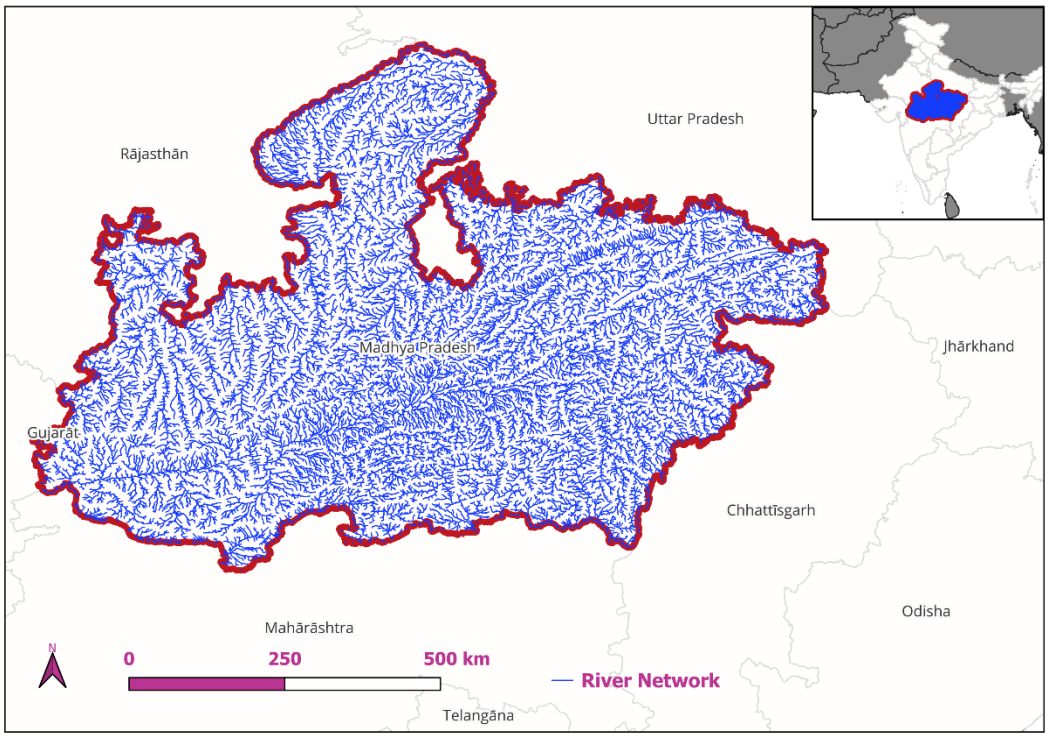



**Figure 12: River network within the geographical area, Madhya Pradesh[18]**

## Topography

Madhya Pradesh lies over 6 distinct physiographic units: (1) the Malwa Plateau, (2) the Satpura Range, (3) the Vindhyan Range, (4) the Mahakoshal Range, (5) the Bundelkhand Region, (6) the River Valleys. The physiography of the State mostly consists of low hills, plateaus and river valleys. The elevation ranges from 90 to 1,100 m a.s.l.

[18] HydroSHEDS was developed by the World Wildlife Fund (WWF) Conservation Science Program in partnership with the U.S. Geological Survey, the International Centre for Tropical Agriculture, The Nature Conservancy, and the Center for Environmental Systems Research of the University of Kassel, Germany, https://developers.google.com/earth-engine/datasets/catalog/WWF_HydroSHEDS_v1_FreeFlowingRivers

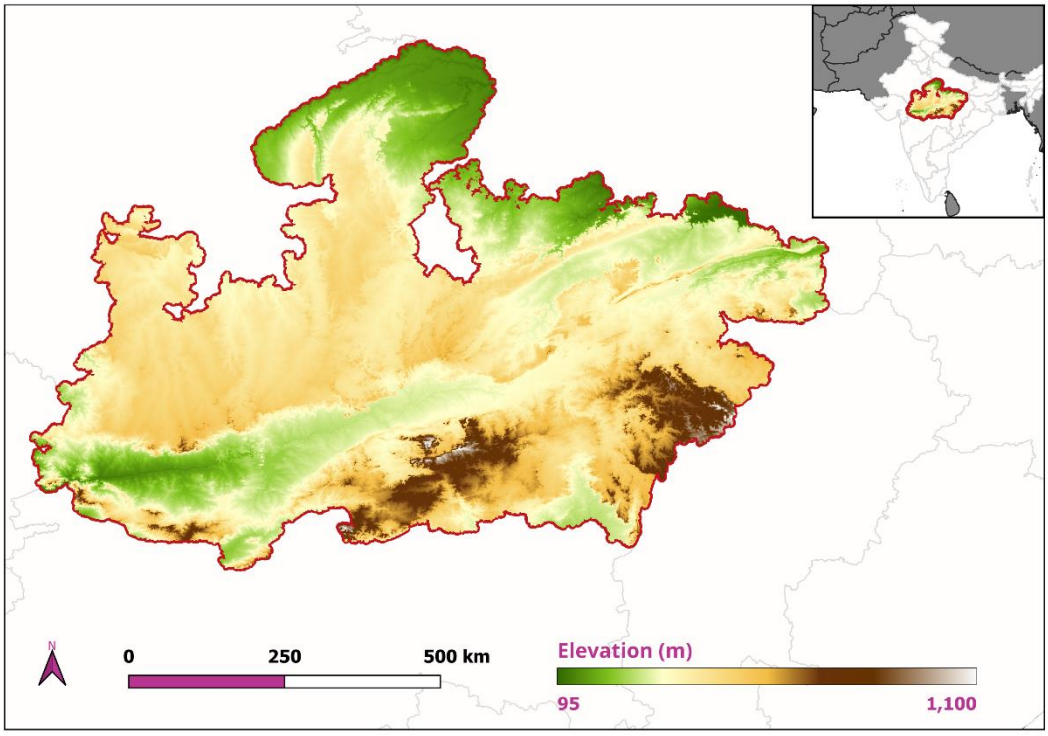



**Figure 13: Elevation within geographical area, Madhya Pradesh[19]**

### Soils

Madhy Pradesh is characterized by 3 main soil types (1) Black soils that cover 47% of the State. They are basic soils who lack nitrogen, phosphorus and carbonic elements but have a high water holding capacity and moisture retention capacity. They are suitable for cotton, wheat and soybean. (2) Red-yellow soils that cover 37% of the State. They are basic and poor in nitrogen and humus but are suitable for rice cultivation. (3) Alluvial soils which cover 3% of the soil of the State. They are neutral and suitable for sugarcane[20].

[19] Hawker, Laurence, Peter Uhe, Luntadila Paulo, Jeison Sosa, James Savage, Christopher Sampson, and Jeffrey Neal. "A 30m global map of elevation with forests and buildings removed." Environmental Research Letters (2022). Dataset: FABDEM (Forest And Buildings removed Copernicus 30m DEM)

[20] Pani P. and Paital B., 2021, Soil type as one of the major contributing factors for top ten agri-producing States of India, Journal of Biomedical Research & Environmental Sciences, < https://www.researchgate.net/publication/356561921_Soil_Type_as_One_of_the_Major_Contributing_Factors_for_Top_Ten_Agri-Producing_States_of_India>

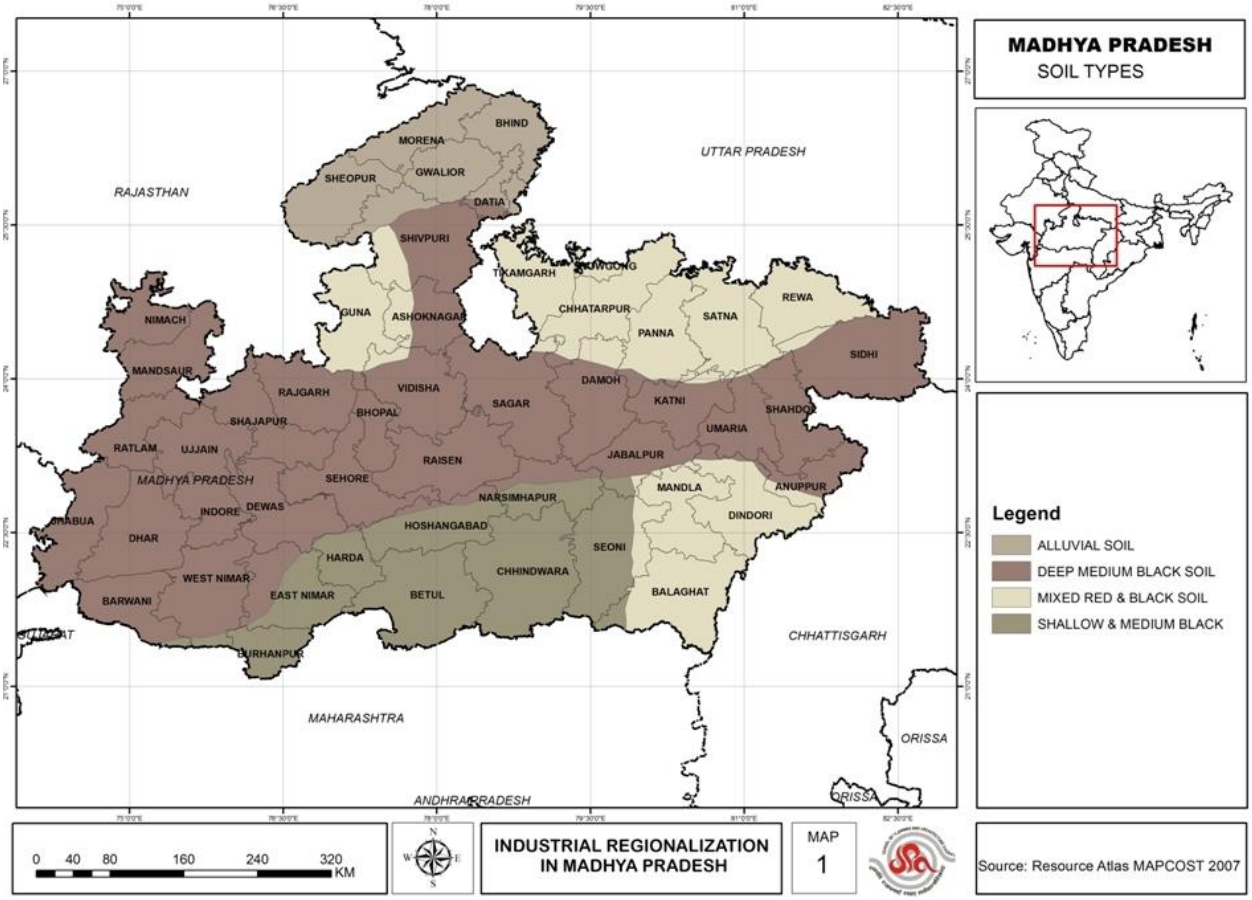



**Figure 14: Soil map of the geographical area, Madhya Pradesh[21]**

### Vegetation and ecosystems

Madhya Pradesh covers an area of 308,252 km2 from which 50% is agricultural land, 28,27% is forest and 4,24% is pasture. The main forest types are (1) Dry teak forest 26,4% of forest cover, (2) Southern dry mixed deciduous forest 24,55%, (3) Northern dry mixed deciduous forest 18,55%, (4) Dry deciduous scrub 8,10%. Of the 146 tree species that can be found in Madhya Pradesh forests, the top five are *Tectona grandis, Shorea robusta, Lagerstroemia parviflora, Diospyros melanoxylon and Anogeissus latifolia*. The main invasive species are *Lantana camara, Cassia tora, Ageratina adenophora, Ageratum conyzoides and Senna occidentalis*[22].

[21] Resource Atlas MPCOST 2007, <jnkvv.org/PDF/27012021221604Atlas JNKVV FINAL.pdf>

[22] Government of India, 2019, India state of forest report 2019, Madhya Pradesh, < https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-madhya-pradesh.pdf>

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

India, as a member of the United Nations Framework Convention on Climate Change (UNFCCC) and an active participant in the International Tropical Timber Organization (ITTO), adheres to the regulatory framework established by these organizations. In the context of the AFOLU (Agriculture, Forestry, and Other Land Use) sector, the project aligns with the objective of reducing greenhouse gas (GHG) emissions through various mechanisms, including afforestation/reforestation. Here is a list of the applicable laws:

*International Tropical Timber Agreement and The International Tropical Timber Organisation (ITTO), 1983, 1994*

The ITTO established by the International Tropical Timber Agreement (ITTA), 1983, came into force in 1985 and became operational in 1987 [3]. The ITTO facilitates discussion, consultation and international cooperation on issues relating to the international trade and utilization of tropical timber and the sustainable management of its resource base. The successor agreement to the ITTA (1983) was negotiated in 1994 and came into force on 1 January 1997. The organization has 57 member countries. India ratified the ITTA in 1996.

In recent years, the Government of Madhya Pradesh has launched various programs in the forestry and related sectors. There has been a substantial increase in budgetary allocations for forest-related activities over the last decade and a half. This rise in funding aligns with the implementation of specific government initiatives and interventions aimed at enhancing the state's forest resources. Madhya Pradesh has played a pioneering role in the realm of participatory forest management and was among the first states to embrace the concept of joint forest management[23].

*UN Convention on Desertification, 1994*

Delegates to the 1992 UN Conference on Environment and Development (UNCED) recommended establishment of an intergovernmental negotiating committee for the elaboration of an international convention to combat desertification in countries experiencing serious drought and/or desertification. The UN General Assembly established such a committee in 1992 that later helped formulation of Convention on Desertification in 1994.

The convention is distinctive as it endorses and employs a bottom-up approach to international environmental cooperation. Under the terms of the convention, activities related to the control and alleviation of desertification and its effects are to be closely linked to the needs and participation of local land-users and non-governmental organizations. Seven countries in the South Asian region are signatories to the Convention, which aims at tackling desertification through national, regional and sub-regional action programmes. The Regional Action Programme has six Thematic Programme Networks (TPN's) for the Asian region, each headed by a country task manager. India hosts the network on agroforestry and soil conservation. For details refer to the land resource chapter.

*The Wildlife (Protection) Act, 1972, Amendment 1991*

[23] https://mpplanningcommission.gov.in/MPES%20Chapterwise/Chapter%2011_Natural%20Resource%20Management.pdf

The WPA (Wildlife Protection Act), 1972, provides for protection to listed species of flora and fauna and establishes a network of ecologically-important protected areas. The WPA empowers the central and state governments to declare any area a wildlife sanctuary, national park or closed area. There is a blanket ban on carrying out any industrial activity inside these protected areas. It provides for authorities to administer and implement the Act; regulate the hunting of wild animals; protect specified plants, sanctuaries, national parks and closed areas; restrict trade or commerce in wild animals or animal articles; and miscellaneous matters. The Act prohibits hunting of animals except with permission of authorized officer when an animal has become dangerous to human life or property or so disabled or diseased as to be beyond recovery (WWF-India, 1999). The near-total prohibition on hunting was made more effective by the Amendment Act of 1991.

*The Forest (Conservation) Act, 1980*

This Act was adopted to protect and conserve forests. The Act restricts the powers of the state in respect of de-reservation of forests and use of forestland for non-forest purposes (the term 'non-forest purpose' includes clearing any forestland for cultivation of cash crops, plantation crops, horticulture or any purpose other than re-afforestation).

*UN Framework Convention on Climate Change (UNFCCC), 1992*

The primary goals of the UNFCCC were to stabilize greenhouse gas emissions at levels that would prevent dangerous anthropogenic interference with the global climate. The convention embraced the principle of common but differentiated responsibilities which has guided the adoption of a regulatory structure.

India signed the agreement in June 1992, which was ratified in November 1993. As per the convention the reduction/limitation requirements apply only to developed countries. The only reporting obligation for developing countries relates to the construction of a GHG inventory. India has initiated the preparation of its First National Communication (base year 1994) that includes an inventory of GHG sources and sinks, potential vulnerability to climate change, adaptation measures and other steps being taken in the country to address climate change. The further details on UNFCC and the Kyoto Protocol are provided in Atmosphere and climate chapter.

*Convention on Biological Diversity, 1992*

The Convention on Biological Diversity (CBD) is a legally binding, framework treaty that has been ratified until now by 180 countries. The CBD has three main thrust areas: conservation of biodiversity, sustainable use of biological resources and equitable sharing of benefits arising from their sustainable use.

The Convention on Biological Diversity came into force in 1993. Many biodiversity issues are addressed in the convention, including habitat preservation, intellectual property rights, biosafety, and indigenous peoples' rights.

India's initiatives under the Convention are detailed in the chapter on Biodiversity. These include the promulgation of the Wildlife (Protection) Act of 1972, amended in 1991; and participation in several international conventions such as CITES.

The State of Madhya Pradesh also has also a set of Laws governing AFOLU activities:

*Compensatory Afforestation Act, 2016*

The primary mandated law that require project activities is the Compensatory Afforestation Act, 2016 (CAF Act 2016) which was enacted in August 2016. The CAF Act created a compensatory afforestation fund as a special fund and also established State Compensatory Afforestation Funds, in addition to establishing the Compensatory Afforestation Fund Management and Planning Authority (CAMPA).

CAMPA funds may be deployed to carry out compensatory afforestation projects, enhance forest quality, fortify forest protection infrastructure, and improve wildlife habitats, although , government initiatives tend to focus more on conserving existing habitats rather than restoring degraded and barren lands or assisting farmers and marginalized communities.

Under-utilisation of CAMPA funds at a State level has hindered the effectiveness of this policy and limited project implementation across India. Recent government data suggests that only 27% of dedicated CAMPA funds were utilised between 2019 and 2022 across the country[24] and in Madya Pradesh in particular, only 22% of CAMPA funds transferred to the State have been utilised over this period[25].

As a result, while Madhya Pradesh had a target of 16,365 hectares for Compensatory Afforestation in 2022-3, only 6,252 hectares were afforested[26]. These implementation and deployment challenges, in addition to a focus on conservation projects, mean that the Panna ARR project serves as a mechanism to implement ARR activities aligned with national policies that might otherwise go unimplemented due to implementation and financial constraints. Hence, this project is considered additional.

*Madhya Pradesh Land Revenue Code, 1959*

The Madhya Pradesh Land Revenue Code of 1959 establishes two safeguards to protect the interests of Scheduled Tribes in the lands they possess[27]:

1) Within Scheduled Tribe areas, any land held by a Scheduled Tribe member cannot be legally sold or transferred to someone outside the Scheduled Tribe community. Such transfers are considered void, regardless of the nature of the consideration, whether it involves cash, loans, or any other form.
2) In regions outside the Scheduled Areas, a similar safeguard is extended to Scheduled Tribe individuals. No transfer to a non-tribal buyer can occur without the explicit permission of the Collector. The Collector's role is to ensure that permission is granted only if the purchaser is a resident of the Scheduled Areas and the transfer does not harm the social, cultural, or economic interests of the Scheduled Tribes.

[24] Data: Only 27% of CAMPA Funds Utilized Between 2019-20 And 2021-22 (factly.in)

[25] Government of India, Ministry of Environment, Forest & Climate Change (2023), Response to Lok Sabha Unstarrred Question No. 5179, "Allocation of Funds under CAMPA"

[26] https://moef.gov.in/wp-content/uploads/2023/05/Annual-Report-English-2022-23.pdf

[27] Section 165,6i and 6ii, 'Madhya Pradesh Land Code 1959' bhu rajsva sanhita eng (mp.gov.in)

*Madhya Pradesh PESA act*

Madhya Pradesh has notified its PESA rules on the occasion of Tribal Pride Day on November 15, 2022. These rules have been made under PESA Act 1996. PESA rules empower Gram Sabhas to take decisions regarding natural resources in scheduled areas – including carbon credits. This has given the tribal community more rights to take advantage of the natural resources of the Scheduled Areas, among other rights (Panchayat & Rural Development Department, 2023).

*Implementation of Action Plan for Sustainable Forest Management*

A ten-year action plan has been prepared for each forest division to ensure sustainable management of the State's forests by setting goals in accordance with the national and state forest policy, keeping the livelihoods of local communities at the Centre. In the FY2021-22, under the work plan for the purpose of conservation of water and soil, treatment work was done in 1.49 lakh hectare area in the managed regeneration group and 3,500 hectares in the restoration group for the improvement of degraded forests. Rs. 15,418.39 lakh was spent in the scheme till December 2021 and 4.11 crore seedlings were planted in the monsoon of the year 2021. (Madhya Pradesh Forest Department, 2022)

## 1.16 Double Counting and Participation under Other GHG Programs

### 1.16.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

### 1.16.2 Registration in Other GHG Programs

Has the project registered under any other GHG programs?

☐ Yes ☒ No

Is the project active under the other program?

☐ Yes ☒ No

### 1.16.3 Projects Rejected by Other GHG Programs

Has the project been rejected by any other GHG programs?

☐ Yes ☒ No

## 1.17 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

### 1.17.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

### 1.17.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

### 1.17.3 Supply Chain (Scope 3) Emissions

Do the project activities specified in Section 0 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

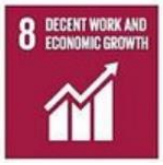
☐ Yes ☒ No

## 1.18 Sustainable Development Contributions

India is committed to Agenda 2030, the Sustainable Development Goals mirror India's nationally stated sustainable development priorities[28].

| SDGs | Summary description of project activities |
|---|---|
| **SDG 1**   | The project supports the SDG 1 as the selected tree species provide local communities with horticultural, medicinal and other produce generated from the plantations. The communities are granted the freedom to either consume or sell these non-timber-based products, enabling them to derive economic benefits from the project. |
| **SDG 2**   | The project supports the SDG1 by implementing Sustainable Agricultural Practices related activities. The project activities also include the implementation of water harvesting structures that will reduce farming vulnerability to drought. |

[28] United Nations and NITI Aayog, 2018, SDG India Index baseline report, < https://www.niti.gov.in/sites/default/files/2020-07/SDX_Index_India_Baseline_Report_21-12-2018.pdf>

| | |
|---|---|
| SDG 8   | The project is providing fair employment opportunities to local dwellers both through casual work opportunities and long-term employment opportunities as Community Mobilizers and Community Resource Persons. |
| SDG 13   | By planting trees on degraded lands, the project aims to enhance carbon sequestration, reduces the soil runoff capacity and improve soil health with the help of bio-fertilizers used during the project resulting in increase in soil fertility, thereby contributing to climate change mitigation and aligning with the objective of SDG 13, which focuses on climate action. |
| SDG 15   | Increasing tree cover on degraded and fragile lands offers numerous vital ecosystem services, including regulating the local microclimate, preserving soil and moisture, and improving the quality and quantity of groundwater. Additionally, trees provide food and habitat for a diverse range of birds, animals, and insects, thereby enhancing local biodiversity. Moreover, the construction of water conservation structures aids in water catchment and contributes to replenishing the groundwater level. |

## 1.19 Additional Information Relevant to the Project

### 1.19.1 Leakage Management

The leakage management plan is based on funding climate smart agricultural project activities with participating farmers on their remaining agricultural land to ensure overall productivity is improved and foregone production is minimized.

In addition, project activities include planting of fruit trees and construction of water harvesting structures which are activities that will generate positive leakage.

Please refer to Section 4.3 for further details on how the project is approaching leakage across the planting models.

### 1.19.2 Commercially Sensitive Information

The public version of the project description includes all relevant information and does not include any commercially sensitive details.

### 1.19.3 Further Information

N/A

# 2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

## 2.1 Stakeholder Engagement and Consultation

### 2.1.1 Stakeholder Identification

| | |
|---|---|
| **Stakeholder Identification** | Stakeholders are identified by project implementation partners using the process outlined in SBIA Manual and involves 5 steps: i) focus group discussions to list and classify stakeholders, ii) stakeholder categorization, iii) assessment of influence and interest; iv) stakeholder motivation and mapping[29].<br><br>For the 2023 pilot, this process was facilitated by Fair Climate Fund India to support capacity building of the project's initial implementation partner, Haritika.<br><br>The stakeholder identification process will be repeated and replicated by project partners in each of the project districts prior to project initiation. Further information is provided in Erreur ! Source du renvoi introuvable..<br><br>**Stakeholders identified:** |

| Primary stakeholders | Secondary stakeholders |
|---|---|
| Participating farmers<br>Village community institutions (*e.g. Gram Panchayat)*<br>Wider community members<br>Haritika NGO<br>Climate Impact Partners | Local government officials<br>Agricultural cooperatives / producer groups<br>Environmental NGOs |

| | |
|---|---|
| **Legal or customary tenure/access rights** | Legal tenure in the project area is determined by named *Khasra* records, the legal land document for the State of Madhya Pradesh. *Khasra* records exist for both private and community land. |

[29] The Social and Biodiversity Impact Assessment Manual for REDD+ Projects ("SBIA Manual" for short) was written to help those who are responsible for the design and implementation of land-based carbon projects to monitor the ways in which their projects affect the local biodiversity and the livelihoods of the people living in and around a project site. https://s3.amazonaws.com/CCBA/SBIA_Manual/SBIA_Part_2.pdf

| | |
|---|---|
| | No other collective and/or conflicting rights held by local communities, tribal communities or customary rights holders have been identified. |
| Stakeholder diversity and changes over time | Farmers and local communities in the project area are a diverse mix of both non-tribal and tribal (*advasi*) populations. Scheduled tribes across the 5 Districts for the project account for 16% of the rural population, against a national average of 11%[30]. Approximately 65% of participating farmers in the initial project instance are from Schedule Tribe households. No significant changes in stakeholder diversity have been reported over time. |
| Expected changes in well-being | Local communities identified the following expected changes in well-being as a result of the project:<br>• Income – diversified income stream through agroforestry and fruit production<br>• Job creation – local communities will benefit through the additional work planting and maintaining community land parcels providing greater income to households involved in the project.<br>• Water availability / biodiversity benefits – increase in water sites will improve biodiversity in the project area.<br>• Improved agricultural production - the implementation of water infrastructure will create more certainty in crop production.<br>• Wider community development benefits – as determined by the communities and implemented via the Community Carbon Fund |
| Location of stakeholders | Stakeholders and beneficiaries of the project are located Madhya Pradesh, India. |
| Location of resources | As above. |

[30] Based on India Census (2011) data by district - Population finder | Government of India (censusindia.gov.in)

### 2.1.2 Stakeholder Consultation and Ongoing Communication

| | |
|---|---|
| **Date of stakeholder consultation** | 10-May-2023 to 03-Jul-2023 (see Appendix 3 for more details)<br><br>19-Dec-2023 to 22-December-2023 |
| **Stakeholder engagement process** | Stakeholder consultations were also organized between May and July 2023, prior to carbon waiver signature. The meetings were organized through the Gram Panchayat or directly with individuals.<br><br>Four stakeholder consultation meetings were then held in December 2023 in Chhatarpur (x2), Panna, Katni and Damoh Districts, where the first project instance was implemented. Meeting dates were communicated within each community via village-level mobilisers and mobile motorcycle announcements, which began a month in advance of the meetings. Other local organisations, including women's groups, local NGOs and local government representatives were also formally invited via invitation letters. The list of invited stakeholders is available to the auditor upon request. Community members and government officials also received a non-technical project summary outlining the project. Initial stakeholder consultation meetings were facilitated by Fair Climate Fund India to support capacity building for local partners with the following agenda:<br><br>1. Opening Remarks<br>2. Overview of project: objectives, activities and Q&A<br>3. Discussion on i) project risks, ii) gender equality and SDGs, iii) project impact, iv) on-going monitoring and responsibilities, v) continuous input mechanism<br>4. Final Q&A and feedback form filling<br>5. Closing remarks.<br><br>Meeting minutes were transcribed in the vernacular and verbal stakeholder questions and responses were recorded. All participants were also provided with stakeholder feedback forms in Hindi to allow for further queries and project views to be captured.<br><br>A total 406 participants attended the 4 meetings in December 2023. This process will be replicated across all Districts in which the project intends to work. |
| **Consultation outcome** | The following points were discussed during the local stakeholder consultations (LSC reports are available for more details):<br><br>• Project design: tree species and models design, carbon mechanism |

| | |
|---|---|
| | • Risks, costs and benefits the project may bring to stakeholders: Tree and carbon benefits, maintenance practices. The benefit sharing mechanism will be presented in more details when relevant<br>• FPIC and carbon: VERRA standard, carbon waivers and FPIC |
| **Ongoing communication** | <u>Local stakeholder consultations</u><br>Annual stakeholder consultations at the district level are scheduled in the project operational calendar to ensure ongoing dialogue and feedback.<br>The operational calendar also maintains an extended period of stakeholder consultations at the start of the annual recruitment phase where the project is introduced, farmer and community interest are assessed and possible sites are identified for upcoming planting.<br>During this phase, meeting attendance, community questions and dates/locations of meeting are recorded, submitted digitally and will be regularly reviewed by implementation partners and project proponents.<br><br><u>Communication prior to each validation/ verification</u><br>In addition, prior to each validation/ verification event, the project proponent will communicate to relevant stakeholders around:<br>• the project design and implementation<br>• the risks costs and benefits the project may bring to stakeholders<br>• the benefit sharing mechanism where relevant ; the ongoing FPIC process.<br>• All relevant laws and regulations covering workers' rights in the host country.<br>• The process of VCS validation and verification and the validation/verification body's site visit.<br><br><u>Additional communication mechanisms:</u><br>• Information boards are installed in front of community sites<br>• A team of CMs and CRPs are present in the field with frequent visits to planted sites and communication with relevant stakeholders |
| **Stakeholder input** | A number of stakeholder inputs have resulted in project design changes to date, including: |

- Development of an additional planting model that allows for full stand fruit orchards (model 1b) on farmer-owned land was incorporated into the project due to farmer demand.
- Inclusion of fruit orchard planting model (1b) on community land in response to community leadership feedback

All stakeholder feedback are recorded in a dedicated log and assessed to continuously improve the project.


Figure 15: Stakeholder meeting in Rajpura Gram Panchayat Bhavan, Hatta, Damoh held on 20/12/2023


**Figure 16: Banner design for Local Stakeholder Consultation meetings in English and Hindi**

### 2.1.3 Free Prior and Informed Consent

| | |
|---|---|
| Obtaining consent | Consent to implement the project activities was obtained from landowners following multiple stakeholder meetings.<br><br>For community land sites, consent was documented in the form of signed resolutions from each village council (*Gram Panchayat)* and carbon rights agreements which are available to auditors upon request. For private landowners, consent was sought via the carbon waiver agreement.<br><br>All agreements are shared in the local language and are notarized by the local government to ensure consent is validated under local laws. A copy is also shared with each signatory for their own records.<br><br>Where ongoing or unresolved conflicts or disputes are identified on proposed planting sites, these sites are not considered for the project until such time as evidence can be provided that the dispute is resolved. |
| Outcome of FPIC | Information disclosed to project participants prior to project signing includes the following: project duration; carbon rights assignation; carbon fund benefit mechanism; rights and responsibilities of implementing partners and participants. |

### 2.1.4 Grievance Redress Procedure

| | |
|---|---|
| Development process | The process of establishing the Grievance Redress Mechanism for the project has been conducted recognizing existing legal and cultural conflict resolution methods utilized by local stakeholders. The project has engaged and will continue to engage with Gram Panchayat, which are traditional decision-making structures throughout the project lifetime.<br>The grievance redress procedure has been developed with Haritika's team support which is used to grievance redress procedure for their other projects and is aware of culturally appropriate conflict resolution methods. |
| Grievance redress procedure | The grievance redress procedure is based on the following principles:<br>1) Receiving grievances: three main channels are used to collect grievance on the project<br>- Project Feedback Form available on CIP's website for all projects |

| | |
|---|---|
| | (https://www.climateimpact.com/project-feedback-form/)<br>- Grievances submitted by/ through Haritika staff (Kobo form)<br>- Grievances submitted on CIP phone number for grievances<br>The grievances should at least contain the submission date, the name of the person submitting the grievance, the location, contact details, wish to remain anonymous or not, details of the grievance,<br>2) All grievances are stored on a unique and dedicated log whose access is restricted to primary users for personal data protection matters<br>3) Grievances are assessed on a bi-weekly basis by CIP's Carbon Project Delivery and NBS Technical team working on the project. During that assessment, the resolution path and communication/ other stakeholders to be involved are defined, and responsibilities are attributed. The project proponent attempts to amicably resolve all grievances and provide a written response in a manner that is culturally appropriate. Any grievances that are not resolved by amicable negotiations shall be referred to mediation by a neutral third party to be defined. Any grievances that are not resolved through mediation shall be referred either to a) arbitration, to the extent allowed by the laws of the relevant jurisdiction or b) competent courts in the relevant jurisdiction, without prejudice to a party's ability to submit the grievance to a competent supranational adjudicatory body, if any. |

### 2.1.5 Public Comments

This section will be updated after the public comment period.

| Comments received | Actions taken |
|---|---|
| N/A | N/A |

## 2.2 Risks to Stakeholders and the Environment

### 2.2.1 Management Experience

Haritika have been in operation for over 25 years and are currently working with 18 different donor organisations. Haritika's success in the Bundelkhand region has been due to their engagement with local nontribal and tribal communities. By employing staff within the local communities, Haritika has been able to better represent these communities in decision making, providing opportunities for underrepresented

groups. As the project scales we will work with Haritika to develop policies and best working practises to ensure staff and communities are treated equitably and discrimination is avoided.

### 2.2.2 Risk Assessment

| | Risks identified | Mitigation or preventative measure(s) taken |
|---|---|---|
| Natural and human-induced risks to stakeholders' wellbeing | No risk identified | |
| Risks to stakeholder participation | No risk identified | |
| Working conditions | • Site preparation is undertaken in the dry season, conditions are hot and dusty<br>• Lack of training on health and safety | • Provide areas of shade for workers and access to drinking water<br>• Work during times where temperature is coolest during the day (early morning, later afternoon)<br>• Provide training on creating safe working environments |
| Safety of women and girls | • Potential risk of travelling to and from land parcels for women (no girls working on the project) | • Ensure women only work within their communities.<br>• Ensure women leave the land parcels early enough to return home together and in day light |
| Safety of minority and marginalized groups, including children | No risk identified | |
| Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers) | Issues around the disposal of the plastic bags that the saplings are delivered in. | No mitigation measures currently identified |

## 2.3 Respect for Human Rights and Equity

### 2.3.1 Labor and Work

| | Risks identified[31] | Mitigation or preventative measure(s) taken |
|---|---|---|
| Discrimination | • Exclusion or limitation of participation of women<br>• Exclusion of older workers | The project proponent and all implementation partners have documented policies regarding discrimination and sexual harassment in place. These are available to the auditor upon request. |
| Sexual harassment | Sexual harassment | |
| Equal pay for equal work | • Unequal pay due to discrimination<br>• Assignment of menial tasks due to discrimination | Equal opportunities have been provided in the context of gender equity and pay for labour and work. Both male and female labourers receive fair and equal remuneration.<br>Equal opportunities have been provided in the context of gender equity and pay for labour and work. Both male and female labourers receive fair and equal remuneration. |
| Gender equity in labor and work | Limited decision-making roles for women | |
| Forced labor | Forced labor | The project does not and will not use victims of human trafficking, forced labour, and child labour in project implementation. The national IDs of all full-time and casual staff are checked to ensure a minimum age of 18 before work commences.<br><br>The project proponent and all implementation partners are required to have policies in place relating to human trafficking, forced and child labour. |
| Child labor | Child labor | |
| Human trafficking | Human trafficking | |

[31] The identified risks and commensurate mitigation or preventative measure(s) for forced labor, child labor, and human trafficking, must be inclusive of staff and contracted workers employed by third parties.

| | | |
|---|---|---|
| [redacted] | | Furthermore, a safeguarding check is carried out annually by the project proponent via focus-group discussions with casual workers, selected at random from payroll lists to ensure workers' rights are being respected |

### 2.3.2 Human Rights

The project recognises, respects and promotes the protection of the rights on local communities. The project involves tribal communities in all three blocks. These communities are 'Scheduled Tribes' that are officially recognized under the Constitution of India but fall outside the predominant Indian social hierarchy. While not officially classified as 'indigenous communities' (India has not ratified ILO Convention 169 (1989) but *has* approved the United Nation Declaration on the Rights of Indigenous Peoples (2007)), these Scheduled Tribes have traditional ties to their land and among the most marginalised and disadvantaged socioeconomic groups in India.

| Risks identified | Mitigation or preventative measure(s) taken |
|---|---|
| Displacement and loss of land rights | The project does not involve the transfer or lease of land tenure rights. Only carbon assets (and other environmental assets) are transferred through the carbon waivers. These two aspects are made very clear in all Local Stakeholder Consultations and meetings. |
| Undermining of forest rights legislation | The project respects and upholds the Forest Rights Act |
| Lack of consent and consultation | The project has put in place a set of procedures to ensure Free, Prior and Informed Consent: Local Stakeholder Consultations, grievance mechanism, ongoing communication mechanism. |
| Unequal distribution of benefits | The project will ensure the equal distribution of benefits through the implementation of Carbon Community Funds. |
| Conflicts with customary practices | The project has engaged and will continue to engage with traditional decision-making structures throughout the project lifetime. The Provisions of the Panchayats (Extension to Scheduled Areas) Act, 1996 (or PESA Act) ensures self-governance of Schedule Areas |

| | |
|---|---|
| | through traditional Gram Sabhas (community decision-making structures) and also endows Panchayats with power and authority over a number of functions including: Minor Forest produce, Social Forestry, Land Management, Fisheries, Village Markets, tribal development, Social Justice, Food and Civil Supplies, and subjects related to local institutions. |

### 2.3.3 Indigenous Peoples and Cultural Heritage

The project preserves and protects the cultural heritage of the four Scheduled Tribes present in the project area and involved in the project - the Khairwar, Gond, Bhumiya and Bhil tribes.

| Risks identified | Mitigation(s) or preventative measure taken |
|---|---|
| Conflicts with customary practices | Native tree species are carefully selected based on their cultural significance to the indigenous communities. Trees that hold cultural importance or are used in traditional ceremonies, medicines, or crafts are prioritized for planting, demonstrating respect for local customs and traditions.<br>Indeed, a 2012 study on tribal culture in Chhatarpur District highlighted the importance that the Gond, Saur and Bhil tribal communities place on non-timber forest products from mahua (*madhuca indica*), tendu (*diospyros melanoxylon*) and aonla (*Phyllanthus emblica*) in terms of economic impact.[32] |
| Failure to communicate in a culturally appropriate manner | With CMs and CRPs being from the local communities and with regular site visits the project also maintains meaningful informal dialogue channels with local indigenous communities and local stakeholders, including customary rights holders, this enables Haritika to quickly identify any issues or opportunities within the project. Going forward more structured FPIC |

[32] Raghuwanshi (2012), 'Evalaution Study of Tribal Culture in Chhatarpur District' - "Evaluation Study of Tribal Culture in Chhatarpur District" (haritika.in)

| | |
|---|---|
| | meetings will occur within the communities during each phase of the project cycle to enable Climate Impact Partners to monitor and action feedback across the entire project. |
| Failure to capitalize on local knowledges and practices | The project recognizes the value of indigenous knowledge in sustainable land management. Indigenous communities often possess valuable insights into native tree species, soil fertility enhancement, and traditional agroforestry practices. The project actively involves community members in decision-making and incorporates their knowledge into the afforestation plans, the project currently employs 6 forestry experts from the local communities, by working with the communities and having a strong understanding of local conditions including soil type, drainage etc the forestry experts are able to make recommendations on the best planting models for each site. By working with the communities for the duration of the project we are able to get good feedback on what planting has been successful and what plant species have underperformed; an example of this can already be seen with our Indian Gooseberry saplings which have experienced more mortality than anticipated despite being a native species, this information can now be incorporated into future planting models. |

### 2.3.4 Property Rights

| Risks identified | Mitigation or preventative measure(s) taken |
|---|---|
| N/A | The Madhya Pradesh Land Revenue Code of 1959 establishes two safeguards to protect the interests of Scheduled Tribes in the lands they possess[33]: |

[33] Section 165,6i and 6ii, 'Madhya Pradesh Land Code 1959' bhu rajsva sanhita eng (mp.gov.in)

| | |
|---|---|
| | 3) Within Scheduled Tribe areas, any land held by a Scheduled Tribe member cannot be legally sold or transferred to someone outside the Scheduled Tribe community. Such transfers are considered void, regardless of the nature of the consideration, whether it involves cash, loans, or any other form.<br><br>4) In regions outside the Scheduled Areas, a similar safeguard is extended to Scheduled Tribe individuals. No transfer to a non-tribal buyer can occur without the explicit permission of the Collector. The Collector's role is to ensure that permission is granted only if the purchaser is a resident of the Scheduled Areas and the transfer does not harm the social, cultural, or economic interests of the Scheduled Tribes.<br><br>The carbon agreement signed by Gram Panchayats and individual farmers protects and preserves the property rights of stakeholders involved in the project. The agreement explicitly states that land ownership remains with the landowners, affirming their property rights.<br><br>The project also conducts a validation of land ownership records to confirm property rights reside with registered project participants. |

### 2.3.5 Benefit Sharing

| | |
|---|---|
| **Process used to design the benefit sharing plan** | The benefit sharing plan has been designed by the project proponent and implementing partners in Panna – with some initial consultation with local communities.<br><br>The format and operational aspects of the benefit sharing plan are still under discussion. However, workshops with local communities will be scheduled to introduce the concept of the Community Carbon Fund, establish the Village Development Committees (VDCs) for fund management, and to discuss initial funding proposals. |

| | |
|---|---|
| **Summary of the benefit sharing plan** | The intention is for revenue from a predetermined portion of credit sales to be passed through to communities via a Community Carbon Fund. In addition to this, the project budget has included a fixed contribution to the Community Fund, to be dispensed in the first 10 years of the project. This is to compensate for the initial period of tree growth, where carbon credit sales will be smaller than later years. The community fund is meant for community benefit and hence cannot be transferred to individuals.<br><br>Principally, it will be spent on things that impact a community as a whole like healthcare, education, livelihoods, biodiversity and environment. |
| **Approval and dissemination of benefit sharing plan** | The Benefit-Sharing Agreement is being developed through a collaborative process involving all affected stakeholder groups. This inclusive approach ensured that the agreement was shared in a culturally appropriate manner.<br><br>All beneficiaries participating in the project have signed the Carbon Waiver Agreement with a comprehensive understanding of the benefits they will receive from the project. The agreement will be accessible to all stakeholders as the project is implemented, providing transparency and allowing them to review its terms as needed. The benefit sharing plan and approach will periodically be reviewed to evolve in line with the project lifecycle. |

## 2.4 Ecosystem Health

The project proponent has utilised the Integrated Biodiversity Assessment Tool (IBAT)'s Species Threat Abatement and Restoration (STAR) data to indicate the relative potential contribution to reducing species extinction risk through either threat abatement or restoration activities.

The threat abatement score obtained for the initial activity instance of the grouped project is low, which means that no significant individual species can be severely threatened.

The STAR assessment uses the IUCN Threats Classification System, and it is used to evaluate the factors contributing to the decline of a species. The top five threats, accounting for ~70% of the STAR score, were identified in the analysis:

1. Agricultural and Forestry (22%)
2. Annual and perennial non-timber crops (16%)
3. Hunting and collecting terrestrial animals (14%)
4. Livestock farming and ranching (9%)
5. Wood and pulp plantations (8%)

The STAR reports are available to the auditor upon request.

Through the implementation of proactive measures, the project ensures that its activities do not result in negative impacts on these vital natural systems. This commitment to environmental stewardship underscores the project's dedication to sustainability and responsible land use practices, contributing to the preservation of our precious ecosystems for future generations.

| | Risks identified | Mitigation or preventative measure(s) taken |
|---|---|---|
| Impacts on biodiversity and ecosystems | Changing water flow patterns from their natural range of variation as a result of the dam construction | Dams have been constructed using local stone and cement. Work has been completed using heavy machinery and by hand. The work has been completed in the dry season when the small rivers and streams had stopped flowing.<br><br>The dams installed have been check dams, designed to hold back the water but to allow water to flow over the top of the dam until the dry season. |
| Soil degradation and soil erosion | Changes in water flow patterns caused by dams can lead to increased erosion and degradation of soils in both upstream and downstream areas. Reduced downstream sediment flow can exacerbate erosion, and altered water release patterns can cause erosion and instability of riverbanks. | The small rivers and streams that have had check dams installed on, dry up and stop flowing through the summer months. The dams have been designed to allow water to flow for the majority of the year by not building the dams higher than the river banks.<br><br>Downstream sediment flow is reduced earlier in the year than without the dam.<br><br>The plantation of native trees species will also help in improving soil conditions which would have been eroded over the years, |

| | | |
|---|---|---|
| | | resulting in decreased soil erosion in the area |
| Water consumption and stress | A minor risk on the ground water table of the region on the construction of borewell is there. | The project restores the water table and increases the water availability in the area through engaging in the construction of community tanks, stop and check dams, farm ponds and lakes which will be utilized in capturing the rainwater in the project area and increase in ground water table. |
| | Microbial contamination from compost, and potential runoff into water bodies causing eutrophication. | For every sapling planted 100 grams of Neem Oil Cake and 100 grams of organic compost sourced locally are placed in the pit along with the sapling. On species susceptible to termites 10 grams of *Agadi* are also added. The amounts used are minimal and spread out across a broad area. With the supplements being buried under the native soil and the limited rain fall in the area the risk of eutrophication is low and will be assessed during the EIA and monitored. |

### 2.4.1 Rare, Threatened, and Endangered Species

Is the project located in or adjacent to habitats for rare, threatened, or endangered species?

☒ Yes ☐ No

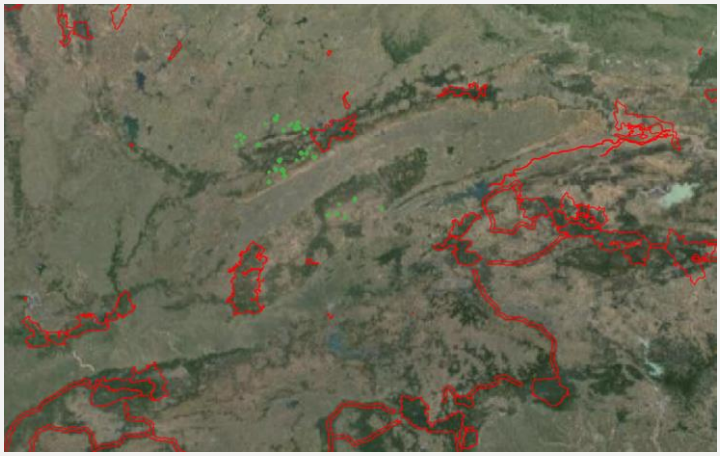
According to the Integrated Biodiversity Assessment Tool (IBAT)'s Biodiversity Risk Screen Report (PS6) for the combined districts for the Panna project, there are 24 IUCN Red List species potentially found within 50km of the area of interest. These include 9 critically endangered reptiles & birds as listed below.

**Table 6: List of IUCN Red list species potentially found within 50km of the project area[34]**

| Species type | Critically endangered (9) | Endangered (15) |
|---|---|---|
| Bird | Great Indian bustard | Indian skimmer |
| | Lesser florican | Black-bellied tern |
| | Sociable lapwing | Pallas's fish eagle |
| | White-rumped vulture | Steppe eagle |
| | Red-headed vulture | Saker falcon |
| | Indian vulture | Egyptian vulture |
| | | Great adjutant |
| Reptile | Gharial | Crowned river turtle |
| | Red-crowned roofted turtle | Yellow monitor |
| | Three-striped roofed turtle | Indian softshell turtle |
| | | Indian peacock softshell turtle |
| Mammals | | Tiger |
| | | Indian pangolin |
| | | Dhole |
| Magnoliopsida | | Teak |

| | |
|---|---|
| Species and habitat | As mentioned, the project has used the IBAT and identified a list of threatened species that could occur within a 50 km buffer from the project. The complete list is presented above.<br><br>The project takes a proactive approach to ensure that it does not adversely impact habitats for rare, threatened, or endangered species. On the contrary, it contributes to the enhancement of local ecosystems.<br><br>The project focuses on increasing native tree cover with species such as Tectona grandis (Teak), Madhuca indica (Mahua), and others. This strategic reforestation effort expands the buffer zone of the Panna National Park and serves to conserve the native ecosystem of the area.<br><br>By planting these native tree species, the project actively supports biodiversity and habitat preservation. The choice of native species helps to create a more favourable |

[34] Integrated Biodiversity Assessment Tool (IBAT) Ps6 Report for Panna Project.

| | |
|---|---|
| | environment for local flora and fauna, as these trees are well-suited to the local ecosystem. |
| Areas needed for habitat connectivity | Biological corridors connect separate areas of habitat, allowing wildlife to migrate and are a way to mitigate the impacts of habitat fragmentation. India's Ministry of Environment, Forest and Climate Change has created a GIS file to allow project proponents to visualize their project vis-à-vis the Protected Areas, Tiger Reserves and corridors[35].<br>  <br>**Figure 17: Plantings sites of the first PAI (in green) vs. connectivity areas (red)**<br><br>The project will not plant within the Panna Tiger Reserve nor in connectivity areas. |

| | Risks identified | Mitigation or preventative measure(s) taken |
|---|---|---|
| Habitats for rare, threatened, and endangered species<br>Areas for habitat connectivity | • Disruption of natural ecosystems<br>• Fragmentation of existing habitats<br>• Introduction of invasive species<br>• Alteration of water resources | The projects plants only native species adapted to the local environmental conditions on degraded lands. The construction of water harvesting infrastructure will help recharge the water tables and impacts will be thoroughly monitored. Drip irrigation is implemented to ensure efficient water usage. |

[35] https://ntca.gov.in/dss/#decision-support-system

| | | |
|---|---|---|
| | • Disruption of migration corridors<br>• Loss of specialized habitats | |

### 2.4.2 Introduction of Species

| Species introduced | Classification | Justification for use | Adverse effects and mitigation |
|---|---|---|---|
| Psidium guajava (Guava) | Native | Fruit bearing | N/A |
| Phyllanthus emblica (Amla) | Native | Medicinal and fruit bearing | N/A |
| Mangifera indica (Mango) | Native | Fruit bearing | N/A |
| Citrus nobilis x Citrus deliciosa (Kinnow) | Native | Fruit bearing | N/A |
| Artocarpus heterophyllus (Jackfruit) | Native | Fruit bearing | N/A |
| Aegle Marmelos (Bel) | Native | Fruit bearing | N/A |
| Gmelina arborea (Khameer) | Native | Medicinal and commercial | N/A |
| Dalbergia sissoo (Shisham) | Native | Commercial | N/A |
| Azadirachta indica (Neem) | Native | Medicinal and commercial | N/A |
| Tectona grandis (Teak) | Native | Commercial | N/A |
| Ficus religiosa (Peepal) | Native | Medicinal | N/A |
| Ficus Benghalensis (Banyan) | Native | Medicinal | N/A |
| Bombax ceiba (Semal) | Native | Medicinal | N/A |
| Mimusops elengi (Molshree) | Native | Medicinal, fruit bearing and commercial | N/A |
| Syzygium Cuminl (Jamun) | Native | Fruit bearing | N/A |
| Annona squamosa (Custard apple) | Native | Fruit bearing | N/A |

| Existing invasive species | Mitigation measures to prevent the spread or continued existence of invasive species |
|---|---|
| Lantana camara | During land preparation and land maintenance, no ligneous species is cleared except for invasive species. |
| Other invasive species: Ageratum conyzoides, Parthenium hysterophorus, Erigeron bonariensis etc. | |

| | Risks identified | Mitigation or preventative measure(s) taken |
|---|---|---|

| | | |
|---|---|---|
| Invasive species | Competition with native species | During land preparation and land maintenance, no ligneous species is cleared except for invasive species. |
| | Reduced access to non-timber forest products for local communities | |

### 2.4.3 Ecosystem Conversion

The project area was not cleared or drained of existing natural ecosystems as demonstrated by GIS analysis of the project area in the 10 years prior to project initiation (satellite imagery April- May 2011 and April – May 2023. All the GIS files are available to the VVB upon request.

**Figure 18: Results of the Forest- Non Forest analysis (non-forest: pink)**

Beyond forest ecosystem conversation, the areas encompassed by this project predominantly consist of barren and degraded lands. These lands, which are under the ownership of the village panchayat, have remained barren for the past decade. Private owned lands are cultivated lands.

| | Risks identified | Mitigation or preventative measure(s) taken |
|---|---|---|
| Ecosystem conversion | N/A | No native ecosystem is converted |

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

| Type | Reference ID | Title | Version |
|---|---|---|---|
| Methodology | VM0047 | VM0047: Afforestation, Reforestation and Revegetation | 1.0 |
| Project module | VMD0054 | Module for Estimating Leakage for ARR Activities | 1.0 |

## 3.2 Applicability of Methodology

The following table outlines how the project will meet the applicability conditions of the VCS Methodology VM0047: Afforestation, Reforestation and Revegetation.

| Methodology ID | Applicability condition | Justification of compliance |
|---|---|---|
| VM0047 | 1) Project activities increase vegetative cover | The project involves direct planting of native tree seedlings on non-forested land. |
| VM0047 | 2) Area based, census based, or a combination of the two quantification approaches may be used provided approach-specific applicability conditions are met. Approaches must be selected at the project start date and used for the entire project crediting period. Where the two approaches are used together, they must be applied in non-overlapping areas defined at the project start (see Section 5 on delineation of spatial boundaries to ensure non-overlap). | The project intends to use both area-based quantification and census-based quantification approaches throughout the project. The project is currently designed so that all planting sites that have continuous cover and in excess of 1ha in size will use area-based quantification, while planting sites less than a 1ha will utilise the census-based approach. The project is asking for a deviation for PAI 1 to use the area-based quantification approach for all planting sites, see section 3.6 below. Spatial boundaries (KML) have been delineated and checked for no-overlap. |

| | | |
|---|---|---|
| VM0047 | 3) Project activities DO NOT involve mechanical removal offsite or burning of significant stocks of pre-existing dead wood (e.g., for site preparation). Where project site preparation includes chipping, mastication or machine piling, all material must remain onsite within the project boundary. | Pre-planting land cover and presence/ absence of dead wood is monitored by the project. The project activities do not involve the mechanical removal offsite or burning of significant stocks of pre-existing dead wood. |
| VM0047 | 4) Project activities DO NOT take place in tidal wetlands (e.g., mangroves, salt marshes). | The project activities do not take place in tidal wetlands. Project activities are inland on degraded land and agricultural land, not along coastal areas subjected to tidal forces, coastal hydrology. |
| VM0047 | 5) Project activities DO NOT occur on organic soils or in wetlands and result in a manipulation of the water table. Planting species that do not naturally occur in organic soils or wetlands is considered a manipulation of the water table. | Project activities do not occur on organic soils or in wetlands, as determined by soil maps, wetland maps, and topographical information to rule out wetland areas and organic soils. All areas to be planted are inspected before planting which will allow to confirm no presence of organic soils/wetlands. |
| VM0047 Area-based approach | 6) Project activities produce continuous tree and/or shrub on any contiguous area exceeding one hectare | The project is currently designed so that all planting sites that have continuous cover and in excess of 1ha in size will use area-based quantification. |
| VM0047 Area-based approach | 7) Projects may include direct (e.g., manual planting, broadcast seeding) and indirect activities (e.g., activities that permit or facilitate natural regeneration, like herbivory exclosures). | Project activities include direct planting. Native tree seedlings plants grown in nurseries are directly planted in designated areas. |
| VM0047 Census-based approach | 8) Project activity must be direct planting (i.e., must not involve facilitated natural regeneration) | Project activities include direct planting and is not based on managed natural regeneration. Native tree seedlings plants |

| | | |
|---|---|---|
| | | grown in nurseries are directly planted in designated areas. |
| VM0047 Census-based approach | 9) Project activity must not produce continuous tree and/or shrub cover on any contiguous area exceeding one hectare | The project is currently designed so that all planting sites that have less than a 1ha will utilise the census-based approach. |
| VM0047 Census-based approach | 10) Individual planting units of woody biomass must be clearly defined (e.g., tree, shrub, bamboo clump) and identifiable in the field, with each planting unit given a physical marker onsite with a unique ID and location recorded by GPS with a minimum accuracy of five meters | The individual planting units of woody biomass is defined as a tree for the project. For all planting sites under census-based approach, each tree is uniquely identified and geotagged with a minimum accuracy of 5 meters. |
| VM0047 Census-based approach | 11) Project activities must<br>a) occur within an area classified as non-forest for the past ten years with less than 10% percent pre-existing woody biomass cover; and/or<br>b) occur in an area subject to continuous cropping, in “settlements”, or “other lands” land use category | The project activities occur on the barren community lands of village panchayats and individual farmlands which are classified as non-forest for the past ten years and have less than 10% pre-existing woody biomass cover, as demonstrated by GIS mapping. |
| VM0047 Census-based approach | 12) An initial complete census of all planting units at t=0 must be conducted | For all planting sites under census-based approach, a complete census of all planting units is completed with each tree uniquely identified and geotagged with a minimum accuracy of 5 meters. |
| VM0047 Census-based approach | 13) Projects are considered ineligible if woody biomass, which serves a similar purpose as the planting units in the project, has been removed within the last ten years (confirmed via pre-project photos and/or attestation) | All project lands were cleared of existing native vegetation over ten years ago. Woody vegetation encountered in the Project Area is therefore sparse. |
| VM0047 Census-based approach | 14) Any soil disturbance from the project activity (i.e., from site preparation):<br>a) occurs only once during the project crediting period (i.e., at site | Soil disturbance from the project activity occurs only once at site preparation and does not involve soil inversion. |

| | | |
|---|---|---|
| | preparation); or<br>b) does not involve soil inversion to a depth exceeding 25 cm (e.g., that would result from a moldboard plow) | |
| VMD0054 | Projects using this module must meet all applicability conditions of the methodology VM0047 Afforestation, Reforestation and Revegetation. | The project meets all applicability conditions of the methodology VM0047 Afforestation, Reforestation and Revegetation. |

## 3.3 Project Boundary

For the first project activity instance (PAI), only the area-based quantification approach will be applied (see Section 3.6 Methodology deviations). The spatial extent of the project boundaries for the first PAI are described in section 1.9. and the corresponding KML file is available.

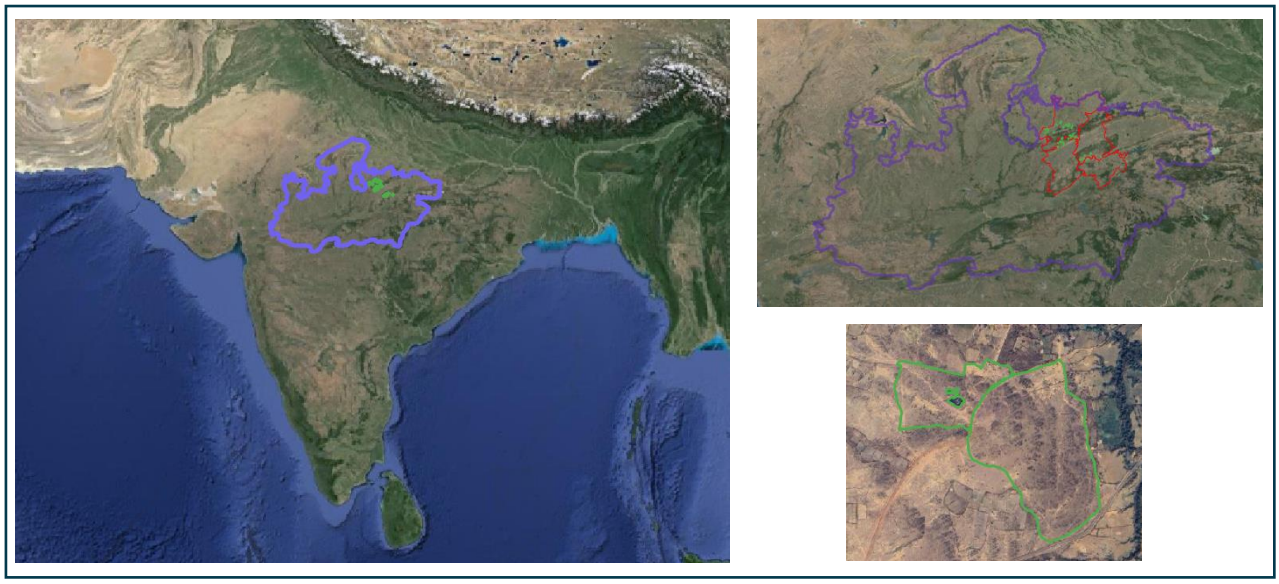


**Figure 19: Map of the Panna Afforestation and Reforestation project first PAI (left: Country level, top right: State level, bottom right: zoom on two planting sites in Damoh district)**

Future PAI will apply a combination of the area-based and census-based approaches on non-overlapping areas. A 10-meter radius buffer around the recorded GPS location of each planting unit will be maintained and visualized through GIS to ensure accounting boundaries do not overlap.

**Table 7: Selected carbon pools in the project boundary using the Area-based approach**

| Carbon pool | Included? | Justification/Explanation |
|---|---|---|
| Aboveground woody biomass | Yes | Major carbon pool |

| | | |
|---|---|---|
| Aboveground non-woody biomass | Excluded | The carbon pool is optional. Also, the project activity does not reduce the carbon pool significantly hence not considered in the carbon pool |
| Belowground woody biomass | Yes | Major carbon pool |
| Belowground non-woody biomass | Excluded | The carbon pool is optional. Also, the project activity does not reduce the carbon pool significantly hence not considered in the carbon pool |
| Dead wood | Excluded | Carbon stock in this pool may increase due to the project activity but conservatively excluded |
| Litter | Excluded | The carbon pool is optional. Also, the project activity does not reduce the carbon pool significantly hence not considered in the carbon pool |
| Soil organic carbon (SOC) | Excluded | Carbon stock in this pool may increase due to the project activity but not considered as a conservative approach.<br>SOC can be excluded as soil disturbance from the project activity (from site preparation):<br>1) Occurs only once during the project crediting period<br>2) Does not involve soil inversion |
| Harvested wood products | Excluded | Conservative to exclude |

**Table 8: Selected carbon pools in the project boundary using the Census-based approach**

| Carbon pool | Included? | Justification/Explanation |
|---|---|---|
| Aboveground woody biomass | Yes | Major carbon pool |
| Aboveground non-woody biomass | Excluded | Conservative to exclude |
| Belowground woody biomass | Yes | Major carbon pool |
| Belowground non-woody biomass | Excluded | Conservative to exclude |
| Dead wood | Excluded | Conservative to exclude |
| Litter | Excluded | Conservative to exclude |
| Soil organic carbon (SOC) | Excluded | Conservative to exclude |
| Harvested wood products | Excluded | Conservative to exclude |

The following table has been filled following VM0047.

**Table 9: GHG sources included in or excluded from the project boundaries**

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Burning of biomass (whether by natural or anthropogenic causes) | $CO_2$ | No | Conservative to exclude |
| | | $CH_4$ | No | Conservative to exclude |
| | | $N_2O$ | No | Conservative to exclude |
| | | Other | No | Conservative to exclude |
| | Emissions from nitrogen fertilizer | $CO_2$ | No | Conservative to exclude |
| | | $CH_4$ | No | Conservative to exclude |
| | | $N_2O$ | No | Conservative to exclude |
| | | Other | No | Conservative to exclude |
| | Burning of fossil fuels | $CO_2$ | No | Conservative to exclude |
| | | $CH_4$ | No | Conservative to exclude |
| | | $N_2O$ | No | Conservative to exclude |
| | | Other | No | Conservative to exclude |
| Project | Burning of biomass (whether by natural or anthropogenic causes) | $CO_2$ | No | Carbon stock decreases due to burning are accounted as a carbon stock change |
| | | $CH_4$ | Yes | May be a significant source |
| | | $N_2O$ | Yes | May be a significant source |
| | | Other | No | Conservative to exclude |
| | Emissions from nitrogen fertilizer | $CO_2$ | No | Conservative to exclude |
| | | $CH_4$ | No | Conservative to exclude |
| | | $N_2O$ | Yes | May be a significant source |
| | | Other | No | Conservative to exclude |
| | Burning of fossil fuels | $CO_2$ | No | De minimis |
| | | $CH_4$ | No | De minimis |
| | | $N_2O$ | No | De minimis |
| | | Other | No | De minimis |

## 3.4 Baseline Scenario

**Area-based approach**

Following Section 8.6 of VM0047, $\Delta SI_{control}$ for the first PAI (also first annual cohort) has been modelled for ex-ante calculations based on performance between t and t-10 assuming a linear relationship, as observed on representative remotely sensed control plots located outside of any registered AFOLU project area. The result is linear and constant (no slope), hence allowing to assume the business-as-usual (BaU) growth of carbon stocks. More details can be found in section 4.1 of this document. The same process will be repeated to future PAI/ annual cohort separately.

A performance benchmark will be used for the establishment of baseline in ex-post calculations. The performance benchmark is determined by comparing the average rate of increase stocking index (SI) between project and control plots. Performance benchmarks are monitored ex-post, hence are dynamic and representative of the reality of carbon stock changes. The description of the process below is derived from "Appendix 1: Performance method" in VM0047:

Step 1: selection of project plots

1) The entire project annual cohort (PAI1) has been divided into contiguous, non-overlapping unit (project plots) of 0.81 hectares. At least 75% of each unit is within the project area boundary.

2) n=30 project plots have been randomly sampled

Step 2: select control plots for each project plot

1) Select donor pool area

A detailed overview of exclusion zones, land tenure boundaries, protected areas, and locations of registered AFOLU projects (Agriculture, Forestry, and Other Land Use) is provided in the following maps. The donor pool plays a pivotal role by considering and delineating the unique biome class of each project area within which controls units are matched. To ensure accuracy in comparison, control areas—carefully chosen within the same biome as the project area —are utilized for benchmarking purposes. Protected areas such as Panna National Park, and polygons from other VCS projects are excluded from donor pool selection area.

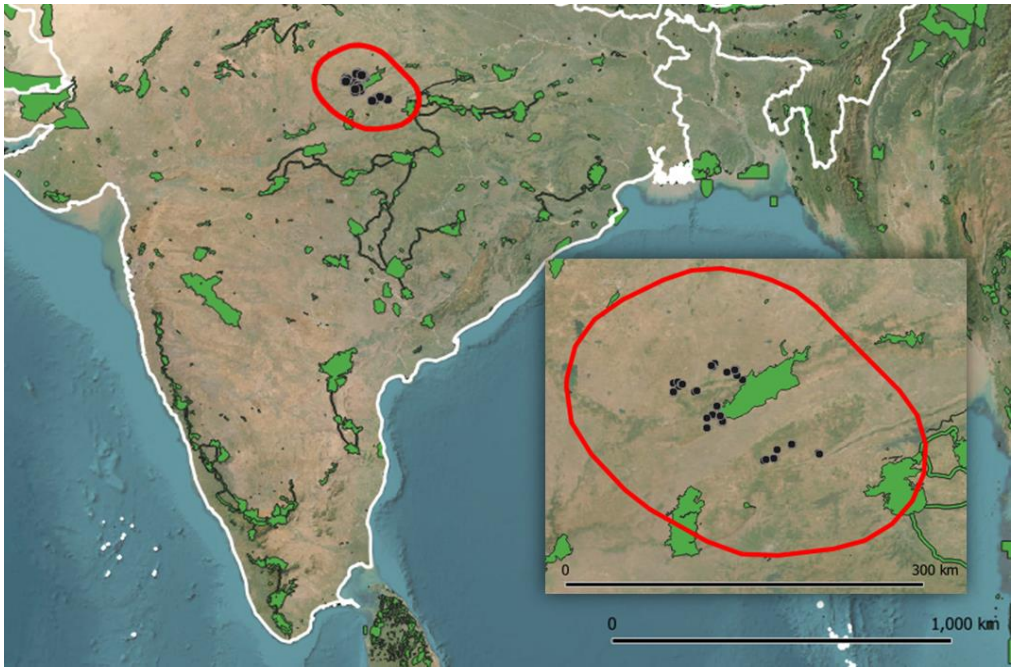



**Figure 20: Exclusion zones (in green) overlaid on a map, delineating land tenure, protected areas, and registered AFOLU projects. The black dots pinpoint the project area location, while the red line outlines the 100km region used for matching purposes**

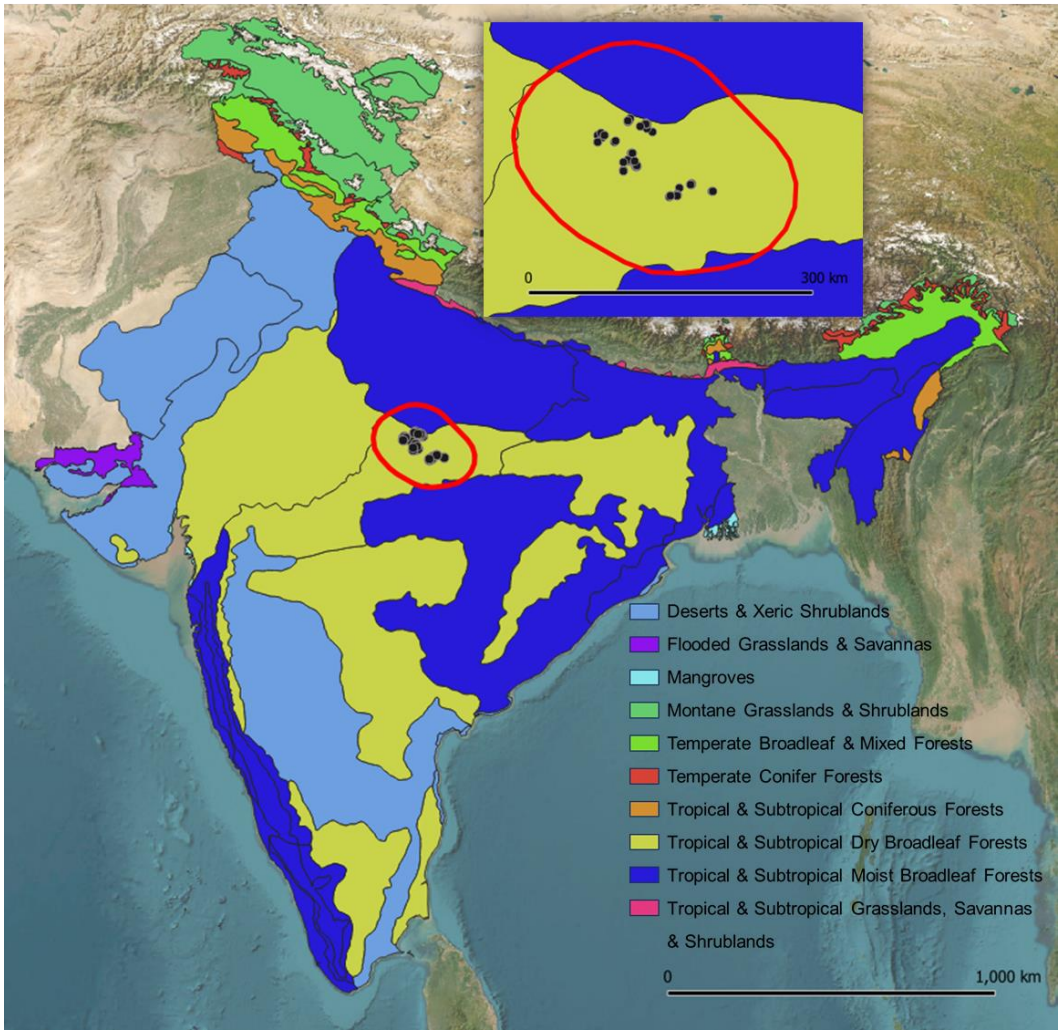



**Figure 21: Biome classes for delineating the donor pool**

2) Evaluate project plots

The donor pool area has been divided into non-overlapping units of 0.81 ha. The nine time points selected for PAI1 are on an annual basis, from t=-8 (2015) to t=0 (2023).

A regression has been run for the SI of each control plot and project plot as a function of time. For each control plot, a multivariate distance metric (MD), the Euclidian distance, has been calculated across the vector of covariates relative to the project plot.

Two Stocking Index (SI) metrics will be utilized for the project - $SI_1$ for control plot selection and $SI_2$ for performance benchmark monitoring.

The project has utilized Normalized difference vegetation index (NDVI) as the stocking index ($SI_1$) for control plot selection using composites obtained from satellite images of the project site captured during the dry season months (April to May) to minimize variability due to seasonality and coinciding with months of lowest cloud cover. The NDVI composites are derived from Landsat-8 images taken between 2015 and

2023, using surface reflectance level products. NDVI is well known to be positively correlated to above ground biomass.
Control selection is based on $SI_1$ (NDVI) which works well for quantification of green biomass mainly for grass and shrublands. However, the saturation of NDVI for areas with high LAI/biomass is well known, as are problems with respect to monitoring woody biomass. Therefore, during implementation a second metric ($SI_2$) may be utilized for deriving the performance benchmark.

3) Select control plots
A 10-nearest neighbor optimal matching approach without replacement has been applied i.e. those who have the lowest multivariate distance metric values.

The relative weights proportional to the inverse of the multivariate distance metric value, that sum to 1, have been derived using Equation (A1):

Where:

$$Wcontrol, i, j = \frac{e^{-MDi,j}}{\sum_{j=1}^{ni,j} e^{-MDi,j}} \qquad (Equation\ A1)$$

$W_{control,i,j}$ = Weight of control plot j matched to project plot i (value between 0 and 1; dimensionless)
$MD_{i,j}$ = Multivariate distance of control plot j relative to project plot i (dimensionless)
$n_{i,j}$ = Number of control plots matched to project plot i (equal to k at project start date)

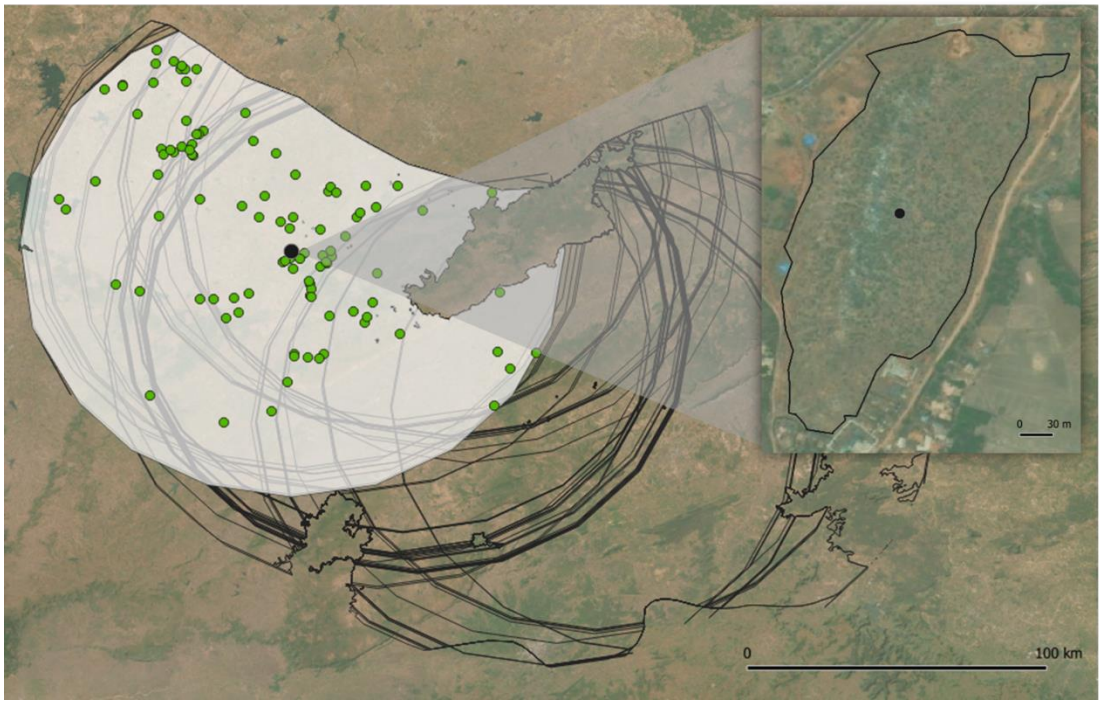



**Figure 22: Illustrative donor pool matching process for a project plot**

Step 3: Evaluate match quality and finalize matching

To quantify the matching quality, the standardized difference of means (SDM) is calculated between the selected controls and the corresponding project units as described in the page 59 of the methodology, using Equation (A2) which as follows:

$$SDM = ABS(x_{WP,x} - x_{bsl,x}) / \sqrt{(\frac{\partial^2{}_{wp,x} + \partial^2{}_{bsl,x}}{2})} \quad (Equation\ A2)$$

Where:

SDM = Standardized difference of means
$x_{WP,x}$ = Mean value of covariate x in the population of project plots
$x_{bsl,x}$ = Mean value of weighted sums of covariate x in the population of matched sets of control plots
$\partial^2{}_{wp,x}$ = Standard deviation of covariate x in the population of project plots
$\partial^2{}_{bsl,x}$ = Standard deviation of covariate x in the population of control plots

Overall match results are deemed valid where SDM for each covariate is less than or equal to 0.25.

The table below shows the SDM obtained for the control matching results in each year, confirming the required matching quality.

**Table 10: Overview of standardized difference of means for stocking index over historical reference period**

| Year | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|---|
| **SDM** | 0.0106 | 0.0096 | 0.0031 | 0.0034 | 0.0072 | 0.0025 | 0.0331 | 0.0075 | 0.0029 |

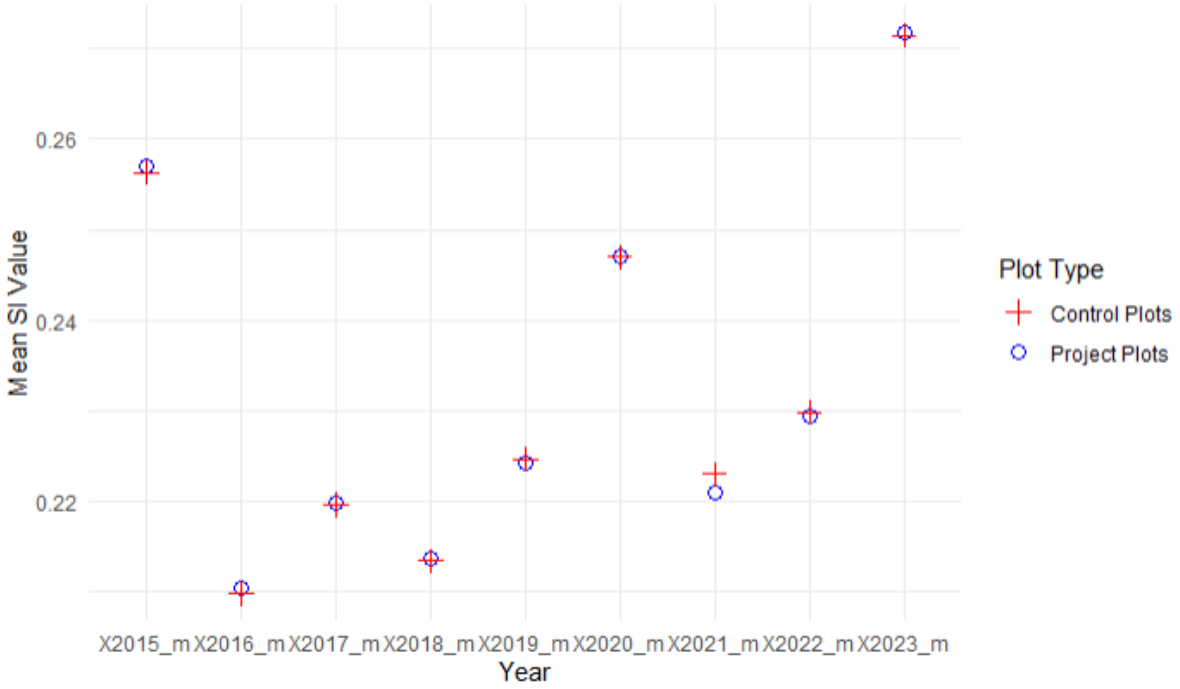



**Figure 23: Mean covariate values for project and control plots**

Step 4: Monitor control and project plots

A second metric to be defined ($SI_2$) may be utilized for monitoring the performance benchmark as detailed in Step 2.

At each monitoring event, any control plot deemed invalid due to their location in areas no longer matching the project area will be removed. The excluded control plot will be replaced from the donor pool selected in Step 2 and weights of control plots will be recalculated.

The SI will be re-evaluated for all control and project plots.

Remote sensing data will be acquired on an annual basis from Sentinel 2 and Landsat 8 utilizing the tiles highlighted in the figure below to derive the stocking index.

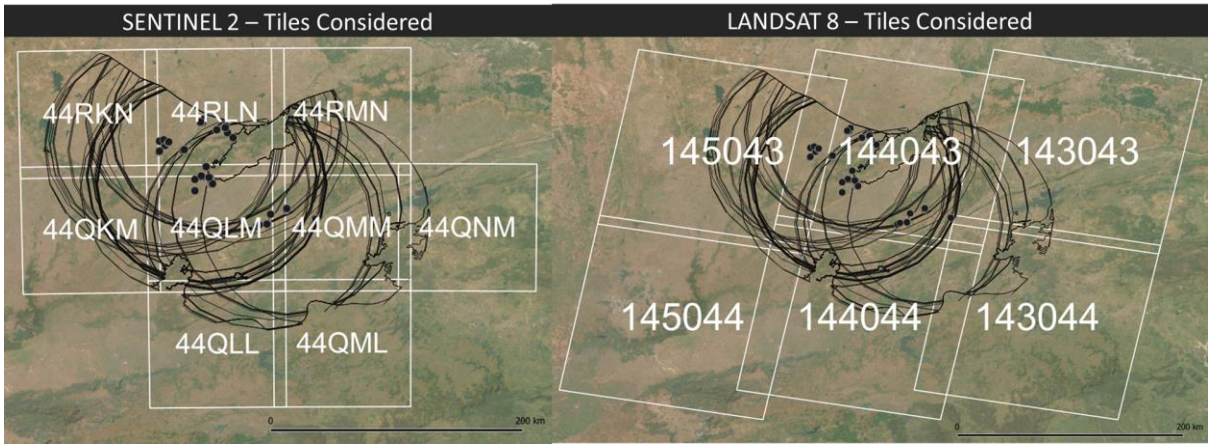



**Figure 24: Relevant SENTINEL 2 and LANDSAT 8 tiles for the project**

Step 5: Derive and evaluate slopes for time series of stocking indices

T, t=0 and another point for SI ; SI values must be available at time t for the project plot I and all matched control plots; n=30 minimum; weight, Z test; Z must be > 1.96 to be deemed significant

The derivation of SI for both project plots and control plots for the monitoring interval will include at minimum three time steps: t, t=0 and one time point between t and t=0. The rate of increase in stocking index in the control and project plots, ΔSIcontrol,t and ΔSIwp,t, will be calculated as the slope of the weighted linear regression of the accumulated time series of SI values for the respective population of plots.

Weights of SI values for control plots in the time series will be calculated as:

$$Wcontrol,i,j,t = Wcontrol,i,j \times \frac{1}{\sum_{t=0}^{t} n\_rst} \quad (Equation\ A1)$$

Where:

$W_{control,i,j,t}$ = Weight of control plot j matched to project plot i at time t (dimensionless)

$W_{control,i,j}$ = Weight of control plot j matched to project plot i (value between 0 and 1; dimensionless)

$n\_rs_t$ = Number of project plots and matched control plots (i,j) with values assessed at time t

Weights of SI values for project plots in the time series will be calculated as:

$$Wp,i,t = \frac{1}{\sum_{t=0}^{t} n\_rst} \quad (Equation\ A4)$$

Where:

$W_{wp,i,t}$ = Weight of project plot i at time t (dimensionless)
$n\_rS_t$ = Number of project plots and matched control plots (i,j) with values assessed at time t

The significance of the difference between $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ is evaluated with a Z test as follows:

$$Z = \frac{\Delta SIwp,t - \Delta SIcontrol,t}{\sqrt{(SE2\Delta SI_{wp},t + SE2\Delta SI\_control,t)}} \text{ (Equation A5)}$$

Where:

Z = Z value (unitless)
$\Delta SI_{control,t}$ = Average annual increase (slope) in stocking index SI in control plots through time t
$\Delta SI_{wp,t}$ = Average annual increase (slope) in stocking index SI in project plots through time t
$SE^2{}_{\Delta SI\_wp,t}$ = Squared standard error of the average annual increase (slope) in stocking index SI in project plots through time t
$SE^2{}_{\Delta SI\_control,t}$ = Squared standard error of the average annual increase (slope) in stocking index, SI, in control plots through time t
t = 1, 2, 3, …, t years elapsed since the project start date

Step 6: Derive performance benchmark

The performance benchmark will be derived from the following equation:

$$PBt = \Delta SIcontrol,t \times \frac{1}{\Delta \text{SIwp,t}} \ (Equation\ A6)$$

Where:

$PB_t$ = Performance benchmark for the monitoring interval ending at year t, dimensionless
$\Delta SI_{control,t}$ = Average annual increase in stocking index, SI, in control plots through time t
$\Delta SI_{wp,t}$ = Average annual increase in stocking index, SI, in project plots through time t
T = 1, 2, 3, …, t years elapsed since the project start date

**Census-based approach**

The project activity will:

1) occur within areas with pre-existing woody biomass cover of less than ten percent. A GIS analysis will be carried out to confirm the eligibility of the area to be planted
2) will most certainly occur on area subject to continuous cropping, in settlement(s), or on lands categorized as 'other lands' due to the land tenure type of lands below 1 ha (farmer private land)

As the project meets these criteria, and following VM0047, it can be assumed that afforestation, reforestation, or revegetation will not occur without project interventions and the crediting baseline may be set to zero.

## 3.5 Additionality

### 3.5.1 Regulatory Surplus

Is the project located in an UNFCCC Annex 1 or Non-Annex 1 country?

☐ Annex 1 country ☒ Non-Annex 1 country

Are the project activities mandated by any law, statute, or other regulatory framework?

☒ Yes ☐ No

If the project is located inside a Non-Annex 1 country and the project activities are mandated by a law, statute, or other regulatory framework, are such laws, statutes, or regulatory frameworks systematically enforced?

☐ Yes ☒ No

The primary mandated law that require project activities is the Compensatory Afforestation Act, 2016 (CAF Act 2016) which was enacted in August 2016. The CAF Act created a compensatory afforestation fund as a special fund and also established State Compensatory Afforestation Funds, in addition to establishing the Compensatory Afforestation Fund Management and Planning Authority (CAMPA).

CAMPA funds may be deployed to carry out compensatory afforestation projects, enhance forest quality, fortify forest protection infrastructure, and improve wildlife habitats, although , government initiatives tend to focus more on conserving existing habitats rather than restoring degraded and barren lands or assisting farmers and marginalized communities.

Under-utilisation of CAMPA funds at a State level has hindered the effectiveness of this policy and limited project implementation across India. Recent government data suggests that only 27% of dedicated CAMPA funds were utilised between 2019 and 2022 across the country[36] and in Madya Pradesh in particular, only 22% of CAMPA funds transferred to the State have been utilised over this period[37].

As a result, while Madhya Pradesh had a target of 16,365 hectares for Compensatory Afforestation in 2022-3, only 6,252 hectares were afforested[38]. These implementation and deployment challenges, in addition to a focus on conservation projects, mean that the Panna ARR project serves as a mechanism

[36] Data: Only 27% of CAMPA Funds Utilized Between 2019-20 And 2021-22 (factly.in)

[37] Government of India, Ministry of Environment, Forest & Climate Change (2023), Response to Lok Sabha Unstarrred Question No. 5179, "Allocation of Funds under CAMPA"

[38] https://moef.gov.in/wp-content/uploads/2023/05/Annual-Report-English-2022-23.pdf

to implement ARR activities aligned with national policies that might otherwise go unimplemented due to implementation and financial constraints. Hence, this project is considered additional.

### 3.5.2 Additionality Methods

A project activity is additional if it can be demonstrated that the activity results in emission reductions or removals that are in excess of what would be achieved under a "business-as-usual" scenario and the activity would not have occurred in the absence of the incentive provided by the carbon markets. The following additionality analysis is based on Section 7 from VM0047:

**Area-based approach**

Step 1: Regulatory surplus

See Section 3.5.1 above.

Step 2: Performance benchmark

To demonstrate additionality at validation projects must apply an ex-ante calculation to demonstrate an expected difference between modelled performance of the project and the forecasted performance benchmark.

- $\Delta SI_{control,t}$ has been modelled based on performance between t and t-8 assuming a linear relationship and set to $\Delta SI_{control,10}$=0.19% Please refer to Section 4.1 for more details.
- $\Delta SI_{wp,t}$ has been modelled from relationship between growth and yield values, above ground biomass (using above-ground carbon stocks value in year 10. For more details, please refer to Section 4.4), and stocking index, NDVI from Wungshap H. and al., 2023[39] :

$$y = 188.93x + 69.687\ (R^2 = 0.6183)$$

Where:

y: Above-ground biomass expressed in tdm.ha$^{-1}$

x: NDVI, dimensionless

As a result, the following value has been used: $\Delta SI_{wp,10}$=16%

- The significance of the difference between $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ has been evaluated with a Z test as follows:

$$Z = \frac{\Delta SIwp,10 - \Delta SIcontrol,10}{\sqrt{(SE2\Delta SI_{wp},10 + SE2\Delta SI\_control,10)}}$$

Where:

Z = Z value (unitless)

$\Delta SI_{control,10}$ = Average annual increase (slope) in stocking index SI in control plots through time t

$\Delta SI_{wp,10}$ = Average annual increase (slope) in stocking index SI in project plots through time t

$SE^2{}_{\Delta SI\_wp,10}$ = Squared standard error of the average annual increase (slope) in stocking index SI in project plots through time t. The value used has been extracted and extrapolated from project plots SI slope analysis between 2015 and 2023.

[39] Wungshap H. and al., 2023, Carbon stock assessment in natural forests and plantations using geo-informatics in Manipur, Northeast India, < https://www.mdpi.com/2073-4395/13/8/2023>

$SE^2_{\Delta SI\_control,10}$ = Squared standard error of the average annual increase (slope) in stocking index, SI, in control plots through time t. The value used has been extracted and extrapolated from project control plots SI slope analysis between 2015 and 2023.
t = 1, 2, 3, …, t years elapsed since the project start date

The Z value obtained is 279.8. Where the absolute value of Z exceeds 1.96, parameters $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ are deemed significantly different, hence the project demonstrates additionality for the performance benchmark as per Section 7 from VM0047. More details of the calculation and assumptions can be provided upon request.

Step 3: Investment barrier

This section is excluded, as per Section 7 of VM0047, which specifies that the investment barrier step is only applied when there are revenues or financial incentives other than from the sale of carbon credits. No revenues or financial incentives other than the sale of carbon credits is driving the project investment case, and therefore this step is excluded.

**Census-based approach**

Step 1: Regulatory surplus

See Section 3.5.1 above.

Step 3: Investment barrier

An investment comparison analysis has been carried out as per VM0047 and the VCS Methodology requirements[40] comparing the following two scenarios:

- Scenario 1: project scenario with benefits from the VCS. The financial plan presented to the VVB and the investors has been used. Note that under this scenario, community funds are included in the project set-up costs as part of the benefit sharing mechanism, as well as a line for profit sharing with the communities. There is no revenue deriving from production as non-timber forest products are benefits for the participating communities and farmers.
- Scenario 2: very unlikely scenario by which CIP would rent lands to produce non-timber forest products and timber products. Project development costs (such as PDD writing, validation and verification costs) and all community benefits costs have been excluded, whereas rental costs for land have been added. No revenue is derived from carbon units. Conservative assumptions have been taken to account for production revenue derived from trees (timber and non-timber forest products).

Note that for conservativeness and simplicity, both scenarios have been compared over the whole project although PAI1 is fully under area-based approach and only a minor share of the following PAIs will be under census-based approach. The selected financial indicators is Investment Rate of Return (IRR), with a result of 12% for scenario 1 and no IRR for scenario 2 and payback period: 13 years for scenario 1 (note that it could be reduced to 0 as the project is receiving upfront investment) and 30 years for

[40] Verified Carbon Standard, 4 October 2023, Methodology requirements v4.4

scenario 2. As per the VCS Methodology requirements, scenario 1 having the highest IRR, it is considered additional. Details of the calculation can be provided as evidence.

Step 4: Common practice

As per VM0047, the following process will be followed that the project activities is not a common practice in the area:

1) The ARR project activity is tree planting
2) The considered geographical domain is the State of Madhya Pradesh
3) The considered landowners group for the census-based approach is smallholders farmers
4) A representative sample of similar landowners within Madhya Pradesh will be surveyed within five years of the project start date
5) The adoption rate of the project activity of landowners who are not part of a registered VCS AFOLU project will be calculated

The adoption rate is expected to be below 15%, proving that the project activity is not common practice and is additional.

## 3.6 Methodology Deviations

The project is applying a methodology deviation on the first Project Activity Instance of the project. The project will use an area-based quantification approach for all planting sites even for planting sites with area inferior to 1 ha. The reason for this deviation is that the project start date is May 2023, i.e. land identification and planting happened before the release of VCS Standard v4.5 which prevented the project to comply with all the requirements under the census-based quantification approach. This deviation only concerns 5% of the planted area and is conservative due to the implementation of the performance benchmark and leakage calculation under the area-based quantification approach.

# 4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

## 4.1 Baseline Emissions

The baseline emissions for the project are calculated according to section 8 of "VM0047- Afforestation, Reforestation and Revegetation", version 1.0.

**Census-based approach**

According to the Section 8.1 of the methodology "VM0047- Afforestation, Reforestation and Revegetation", the baseline scenario is represented by the absence of planting units, and hence carbon stocks in the baseline scenario will be considered as zero in future PAIs.

**Area-based Approach**

Carbon stock changes in the baseline scenario are accounted for by applying the crediting baseline performance benchmark value to the estimation of carbon dioxide removals.

The performance benchmark has been modelled in Section 3.5.2.

- $\Delta SI_{control,t}$ has been modelled based on performance between t and t-8 assuming a linear relationship and set to $\Delta SI_{control,10}$=0.19%

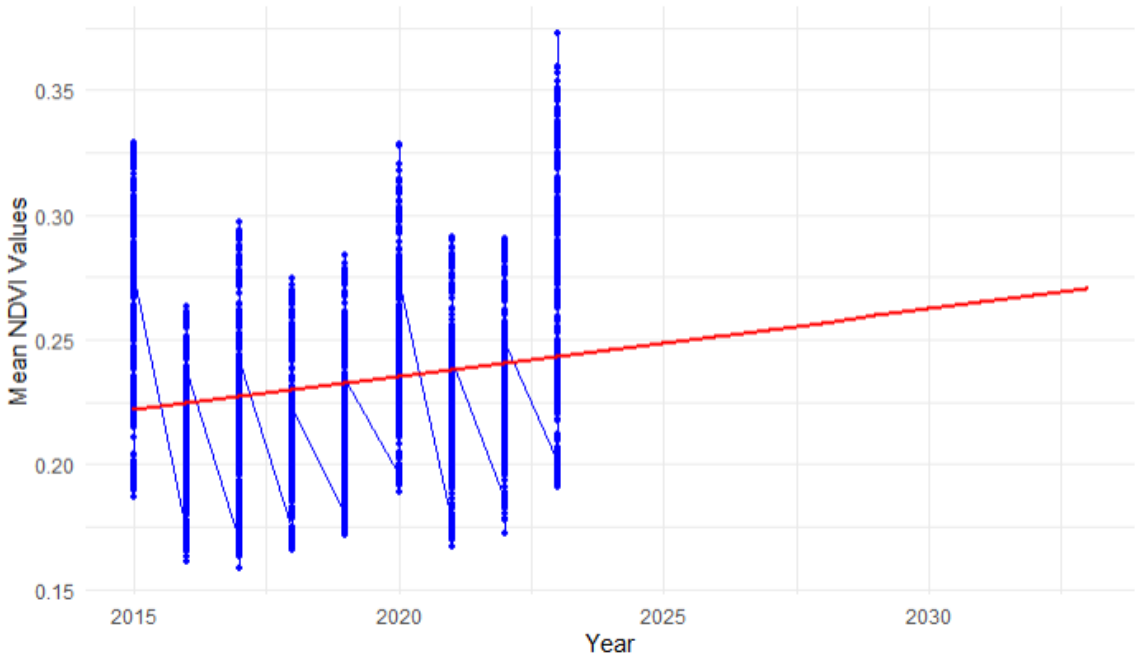



**Figure 25: Historical and predicted mean NDVI values**

- $\Delta SI_{wp,t}$ has been modelled from relationship between growth and yield values, above ground biomass (using above-ground carbon stocks value in year 10. As a result, the following value has been used: $\Delta SI_{wp,10}$=16%
- The significance of the difference between $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ has been evaluated with a Z test. The Z value obtained is 279.8, hence parameters $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ are deemed significantly different.

The performance benchmark has been derived from the following equation:

$$PB10 = \Delta SIcontrol, 10 \times \frac{1}{\Delta \mathrm{SIwp}, 10} \ (Equation\ A6)$$

The resulting value is $PB_{10}$=1.15%. This will be reassessed at verification in line with VM0047 methodological requirements.

## 4.2 Project Emissions

As per the VM0047 requirements described in "Section 8.6 Ex-Ante Estimations", at the time t of validation:

- Estimates must be made for the 10-year period from time t to t+10: provided estimates correspond to the first PAI/ annual cohort for 2023 to 2033 for which only the area-based approach has been used
- Projected changes in biomass must be based on growth and yield models constructed with data and parameters that conservatively represent the project activity: estimations based on growth and yield models constructed from species-specific data from academic research conducted, where possible within India. Sources and calculation sheets are available to the auditor upon request.
- Any harvest regimes or forest management activities planned for the 10-year period over which the ex-ante calculations are projected must be incorporated in modelling the project scenario: no harvest regimes or forest management activities are planned within the 10-year period of which ex-ante calculations are provided.

The procedure used for calculating project emissions under the project utilised relevant equations outlined in VM00047 – Afforestation, Reforestation and Revegetation' v1.0 for the area-based quantification approach, as shown in the figure below.

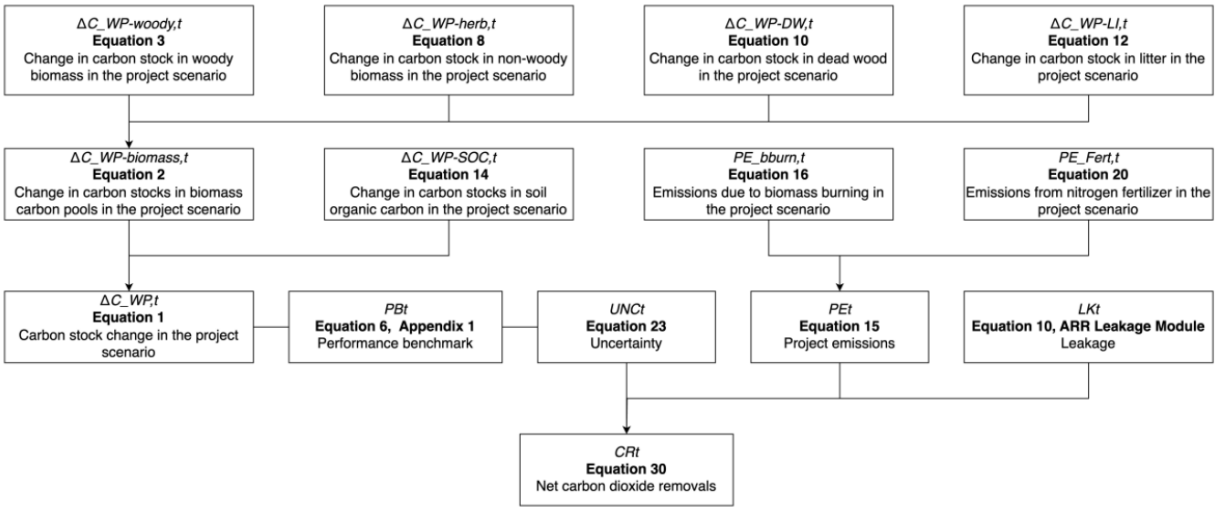



**Figure 26: Summary of calculations for Area-based quantification from VM0047**

As per the carbon pools defined in Table and 11 in Section 3.3, the following equations are employed;

**Table 12: Equation summary**

| Equations | Equation name | Used |
|---|---|---|
| Equation 2 | Change in carbon stocks in biomass carbon pools in project scenario | Yes |
| Equation 3 | Change in carbon stock in woody biomass in the project scenario | Yes |
| Equation 8 | Change in carbon stock in non-woody biomass in the project scenario | No |
| Equation 10 | Change in carbon stock in dead wood in the project scenario | No |
| Equation 12 | Change in carbon stock in the litter in the project scenario | No |
| Equation 14 | Change in carbon stocks in soil organic carbon in the project scenario | No |
| Equation 1 | Carbon stock change in the project scenario | Yes |
| Equation 15 | Project emissions | Yes |
| Equation 16 | Emissions due to biomass burning in the project scenario | Yes |
| Equation 20 | Emissions from nitrogen fertilizer in the project scenario | Yes |
| Equation 23 | Uncertainty | Yes |
| Equation 6, Appendix 1 | Performance benchmark | Yes |
| Equation 10, ARR Leakage Module | Leakage | Yes |
| Equation 30 | Net carbon dioxide removals | Yes |

**Project carbon stock changes**

Please note that only the woody biomass pool (both aboveground and belowground) has been considered below – see Section 3.3 for more details on project boundaries.

The project applies Equation 4 to calculate 'Average carbon stock in woody biomass in the project scenario' in t C/ha shown below.

$$C_{WP-woody,t} = C_{WP-woody-AB,t} * (1 + R) \qquad (Equation\ 4)$$

Where:

- $C_{WP\text{-}Woody,t}$ = Average carbon stock in woody biomass in the project scenario in year t (tC/ha).
- $C_{WP\text{-}woody\text{-}AB,t}$ = Average carbon stock in above-ground woody biomass in the project scenario in year t (tC/ha).
- R = Root to shoot ratio (t root d.m./t shoot d.m).
- t = 1,2, 3,..., t years elapsed since the project start date

$C_{WP\text{-}woody\text{-}AB}$ is calculated by using growth rates and allometric equations from academic literature for each species to calculate estimated above-ground biomass over 10 years on a per-tree basis. The table below provides an overview of the allometric equations used for each species and their sources. This list may be updated if newer sources are published, or if other species are used for the project.

**Table 13: Overview of allometric equations utilized to calculate Above ground biomass**

| Model | Species | Reference(s) | Justification / notes | Link |
|---|---|---|---|---|
| 1 | Aegle marmelos | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 1 | Artocarpus heterophyllus | *Saha et al (2021), 'Allometric biomass models for the most abundant fruit tree species of Bangladesh: A Non-destructive approach', Environmental Challenges 3 (100047)* | Species-specific allometric equation developed in this study based on data from 47 *Artocarpus heterophyllus* trees. This regionally-relevant equation has been utilised in the absence of more localised allometric equations for this species. | Link |
| 1 | Phyllanthus emblica | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 1 | Psidium guajava | *Rodríguez R., J. Jiménez, J. Meza, O. Aguirre y R. Razo. 2008. Carbono contenido en un bosque tropical subcaducifolio en la reserva* | AGB allometric equation for psidium guajava in Tamaulipas, Mexico. Same FAO agroecological Tropical Zone as Panna - Tropical Dry. | Link |

| | | | | |
|---|---|---|---|---|
| | | *de la biosfera el cielo, Tamaulipas, México. Revista Latinoamericana de Recursos Naturales 4 (2):215 -222.* | | |
| 1 | Mangifera indica | *Saha et al (2021), 'Allometric biomass models for the most abundant fruit tree species of Bangladesh: A Non-destructive approach', Environmental Challenges 3 (100047)* | Species-specific allometric equation developed in this study based on data from 47 *Mangifera indica* trees. This regionally-relevant equation has been utilised in the absence of more localised allometric equations for this species. | Link |
| 1 | Citrus nobilis | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 2 | Azadirachta indica | *Mohamed et al (2018), 'Allometric relationships for biomass and carbon estimation of neem (Azadirachta indica) in plantations in dryland of Hyderabad, Telangana, International Journal of Bioresource and Stress Management, 9(1), pp. 37-43* | Allometric equations based on destructive sampling of Azadirachta indica. Equations derived based on research conducted at the Central Research Institute for Dryland Agriculture in Hyderbad which is Tropical Shrubland agroecological zone. This is drier than the project area. | Link |
| 2 | Dalbergia sissoo | *Rai, A.P., Singh, U.P. & Jabeen, N. 2010. Statistical models for prediction of growth and yield of Dalbergia sisoo and Hardwickia binnata under silvipastoral system in India. Indian Journal of Forestry, 33(1): 13?20.* | Allometric equation derived from research by the National Research Centre for Agroforestry in Jhansi approximately 170kms from project area in a similar agroecological zone (Tropical Shrubland). | Link |
| 2 | Gmelina arborea | *Saenz Reyes J.T. et al. (2021) Allometric equations, biomass and carbon in tropical forest plantations in the coast of Jalisco. Revista Mexicana de ciencias forestales. Vol12 65: 87-99.* | Allometric equations based on destructive sampling of *Gmelina arborea*. Equations derived based on research conducted in the East Coast of Mexico. | Link |
| 2 | Tectona grandis | *Negi, M.S., Tandon, V.N. & Rawat, H.S. (1995). Biomass and nutrient distribution in young Teak (Tectona grandis linn.F) plantations in Tarai region of Uttar Pradesh.* | Allometric equation derived from research of teak growth and biomass accumulation in Terai Region of Uttar Pradesh, less than 150km from project area. Authors examined 10-, 20- and 30-year-old teak trees as part of the research | Link |

| | | | | |
|---|---|---|---|---|
| | | *Indian Forester, 121(6): 455-464.* | | |
| 3 | Bombax ceiba | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 3 | Ficus Benghalensis | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 3 | Ficus religiosa | *Rodríguez R., J. Jiménez, O. Aguirre, E. Treviño y E. Treviño. 2006. Estimación de carbono almacenado de niebla en Tamaulipas, México. Ciencia UANL 9(2): 179-188.* | Allometric equation for Ficus spp from Globalometree. Same FAO agroecological Tropical Zone as Panna - Tropical Dry. | Link |
| 3 | Mimusops elengi | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 4 | Anonna squamosa | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 4 | Syzygium Cumini | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 4 | Diospryos melanoxylon | Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees. Global Change Biology. 20: 3177-3190 | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |
| 4 | Maduca longifolia | *Chave et al. (2014) Improved allometric models to estimate the aboveground biomass of tropical trees.* | Utilised a generic allometric equation for Tropical Dry climatic zone based on a dearth of allometric equations for this specific tree species | Link |

| | | | | |
|---|---|---|---|---|
| | | *Global Change Biology. 20: 3177-3190* | | |

The per-tree estimates of above-ground biomass have then been extrapolated for each planting model, based on the proposed density of each species for each planting model, and a tC/tree estimate for each planting model developed from t=1 to t=10.

These estimates of carbon stock per planting model have then been applied, based on total hectares planted for each model in the first Project Activity Instance, to calculate a weighted average of $C_{WP\text{-}woody\text{-}AB}$ across all 4 planting models. This is shown below.

**Table 14: Equation 4 output – average carbon stock in woody biomass in the project scenario over time**

| Year | $CWP\text{-}woody$-AB,t | R | $CWP\text{-}woody$,t |
|---|---|---|---|
| 1 | 0 | 0.44 | 0 |
| 2 | 0 | 0.44 | 1 |
| 3 | 1 | 0.44 | 1 |
| 4 | 3 | 0.44 | 4 |
| 5 | 4 | 0.44 | 6 |
| 6 | 5 | 0.44 | 8 |
| 7 | 7 | 0.44 | 10 |
| 8 | 8 | 0.44 | 12 |
| 9 | 10 | 0.44 | 15 |
| 10 | 12 | 0.44 | 18 |

The root-to-shoot ratio (R) has been taken from Table 4.4 "Tropical dry Asia <125 t d.m./ha" in Chapter 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[41].

The estimation process then utilized the outputs of Table 13 to complete Equation 3 of the methodology which is as follows:

$$\Delta CP_{WP-woody,t} = A * \left(C_{WP-woody,t} - C_{WP-woody,t=0}\right) \qquad (Equation\ 3)$$

Where:

- $\Delta C_{WP\text{-}woody,t}$ = Change in carbon stock in woody biomass in the project scenario through year t (t C).
- A = Area (ha)
- $C_{WP\text{-}woody,t}$ = Average carbon stock in woody biomass in the project scenario in year t (t C/ha).

[41] IPCC, 2019, Chapter 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch04_Forest%20Land.pdf

- t = 1, 2, 3, …, t years elapsed since the project start date.

Utilising the anticipated planting schedule to derive the area in (ha), this provides the final output table below. The conservative exclusion of non-woody biomass (Equation 8), dead wood (Equation 10) and litter (Equation 12) means that:

$$\Delta C_{WP-woody,t} = \Delta C_{WP-biomass,t}$$

| Year | Area (ha) | $C_{WP-woody}$ (t C/ha) | $\Delta C_{WP\text{-}woody}$ (t C) | $\Delta C_{WP\text{-}biomass}$ (t C) |
|---|---|---|---|---|
| 1 | 591 | 0 | -74 | -74 |
| 2 | 591 | 1 | 182 | 182 |
| 3 | 591 | 1 | 669 | 669 |
| 4 | 591 | 4 | 2 390 | 2 390 |
| 5 | 591 | 6 | 3 291 | 3 291 |
| 6 | 591 | 8 | 4 349 | 4 349 |
| 7 | 591 | 10 | 5 617 | 5 617 |
| 8 | 591 | 12 | 7 045 | 7 045 |
| 9 | 591 | 15 | 8 684 | 8 684 |
| 10 | 591 | 18 | 10 458 | 10 458 |

**Table 15: change in carbon stock (tC) in biomass carbon pools in project scenario**

The project also conservatively excludes soil organic carbon, and therefore, calculations deriving $\Delta C_{WP,t}$ in line with Equation 2 of VM0047 are presented in the table below.

**Table 16: Summary of $\Delta CWP$ (tco2e) as per Equation 1 of VM0047**

| Year | $\Delta C_{WP\text{-}biomass}$ (t C) | $\Delta C_{WP\text{-}SOC}$ (t C) | 44/12 | $\Delta C_{WP}$ ($tCO_{2e}$) |
|---|---|---|---|---|
| 1 | -74 | - | 3.67 | -270 |
| 2 | 182 | - | 3.67 | 669 |
| 3 | 669 | - | 3.67 | 2 452 |
| 4 | 2 390 | - | 3.67 | 8 765 |
| 5 | 3 291 | - | 3.67 | 12 066 |
| 6 | 4 349 | - | 3.67 | 15 947 |
| 7 | 5 617 | - | 3.67 | 20 596 |
| 8 | 7 045 | - | 3.67 | 25 833 |
| 9 | 8 684 | - | 3.67 | 31 840 |
| 10 | 10 458 | - | 3.67 | 38 345 |

### Project emissions

Project emissions resulting from the burning of biomass and the use of nitrogen fertilizers are estimated according to the methodology.

In the case of biomass burning, no existing biomass is burnt in the process of clearing, and therefore $PE_{bburn}$ is assumed to be zero.

In the case of fertilizer usage, nitrogen emissions from the application organic fertilizers in line with Equations 20 to 26 in the methodology. Academic sources were utilised to estimate the nitrogen content ($NC_{wp,\ OF,\ t}$) for vermi-compost[42] and neem oil cake[43] and calculations computed based on the assumptions of a one-time application of vermicompost and neem oil cake at planting.

Based on these assumptions, the calculation for $PE_{fert}$ is shown below, with no further application of fertilizer (and hence fertilizer emissions) beyond Year 7 for the first project instance.

**Table 17: Project GHG emissions due to fertilizers**

| Year | $PEN,indirect$ ($tCO_{2e}$) | $PEN,direct$ ($tCO_{2e}$) | $PEfert$ ($tCO_{2e}$) |
|---|---|---|---|
| 1 | 3 | 6 | 8 |
| 2 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 |

Equation 15 combines $PE_{fert}$ and $PE_{bburnt}$ to provide an estimation of project emissions from biomass burning and fertilizer (in tCO2e) using the following calculation:

$$PE_t = PE_{bburn,t} + PE_{fert,t} \qquad (Equation\ 15)$$

Where:

- $PE_t$ = Project emissions from biomass burning and fertilizer in year t (t $CO_{2e}$).
- $PE_{bburn,t}$ = Project emissions due to biomass burning in year t (t $CO_{2e}$).
- $PE_{fert,t}$ = Project emissions from nitrogen fertilizer in year t (t $CO_{2e}$).

The table below provides an overview of Project emissions from t=1 to t=10.

[42] Vermicomposting technology - A perspective on vermicompost production technologies, limitations and prospects - ScienceDirect

[43] Effect of Fertilizers and Neem Cake Amendment in Soil on Spore Germination of Arthrobotrys dactyloides - PMC (nih.gov)

**Table 18: Project emissions (PE) over time**

| Year | $PE_{bburn}$ ($tCO_{2e}$) | $PE_{fert,}$ ($tCO_{2e}$) | PE ($tCO_{2e}$) |
|---|---|---|---|
| 1 | - | 8 | 8 |
| 2 | - | 0 | 0 |
| 3 | - | 0 | 0 |
| 4 | - | 0 | 0 |
| 5 | - | 0 | 0 |
| 6 | - | 0 | 0 |
| 7 | - | 0 | 0 |
| 8 | - | 0 | 0 |
| 9 | - | 0 | 0 |
| 10 | - | 0 | 0 |
| **Total** | **0** | **8** | **8** |

Full calculations and underlying equation calculations used to derived Project Emissions are available to the auditor at validation.

## 4.3 Leakage Emissions

For the estimation of Leakage, "VMD0054, Module for estimating Leakage from ARR activities" will be used. This module accounts for leakage related to the displacement of pre-project agricultural activities (including grazing) and fuelwood collection activities. It includes leakage caused by the baseline agent (activity-shifting leakage) and other actors (market leakage).

Note that for the future Project Activity Instances, for the census-based quantification approach, LKt is set equal to zero. The requirement that the ARR project activity will not produce continuous vegetative cover (associated with the planting units) on any contiguous area exceeding one hectare (Section 4) avoids any significant displacement of a pre-existing land use and leakage effects are assumed to be de minimis. The rationale below only applies to the first PAI for which every land parcel is under an area-based quantification approach.

**Table 19: Overview of leakage across planting models**

| Model | Leakage | Justification |
|---|---|---|
| 1a | No leakage | Low density fruit tree planting will allow for on-going intercropping throughout the project lifetime |
| 1b | Displacement of agricultural activities after Y5 | Higher density fruit tree planting on farmer land will allow for on-going crop production until canopy closure from Y5 onwards, after which activity-shifting leakage will be assessed. |
| 2a | No leakage | Planting will take place along boundaries and bunds of smallholder farmer land |
| 2b | No leakage | |

| | | |
|---|---|---|
| 3 | No leakage | The land tenure type is “community lands”. Pre-project land use include marginal land use. |
| 4 | No leakage | |

Step 1: Determine foregone production in project area

On smallholder farmer land, activity-shifting leakage is assumed for model 1b where higher density fruit tree planting is undertaken from year 5 onwards when canopy closure is expected. For the first PAI, the area eligible for leakage is 59 ha (22% of model 1b is on farmer land).

Based on production data collected by the implementing partner from farmers in the project area, wheat is the predominant crop grown in the *rabi* season (November-April) while farmers grow a mix of soybean and lentils (*urad*) in the *kharif* season (July-October).

One complete crop rotation is one year, hence the historical reference period being 3 years.
The most recent national average values derived from FAO published data have been used:

**Table 20: Amount of production of each commodity being displaced**

| Variable | Yield (kg/ha) | Source |
|---|---|---|
| 2022 Wheat | 3 537 | FAOSTAT India data[44] |
| 2021 Wheat | 3 521 | FAOSTAT India data |
| 2020 Wheat | 3 440 | FAOSTAT India data |
| 2022 Soya bean | 1 069 | FAOSTAT India data |
| 2021 Soya bean | 976 | FAOSTAT India data |
| 2020 Soya bean | 921 | FAOSTAT India data |
| 2022 Lentil | 899 | FAOSTAT India data |
| 2021 Lentil | 1 017 | FAOSTAT India data |
| 2020 Lentil | 847 | FAOSTAT India data |

Equation (1) has been used to calculated baseline production in the project area:

$$BPj,t = \frac{\sum_{h=1}^{H} pj,h}{H} \times (1 + rj)^t \quad (1)$$

Where:

BPj,t = Baseline production in the project area for commodity j in year t (units of production)
pj,h = Production in the project area for commodity j in year h of the historical reference period (units of production)
H = Duration of historical reference period (years)
rj = Annual growth rate of yield for commodity j (percent): or the default value (2.5 percent)

[44] < https://www.fao.org/faostat/en/#data/QCL>

t = 1, 2, 3, …, t years elapsed since the project start date

Foregone production is based on the assumption that yield will decrease by 50% in monitoring period. Monitored production for ex-post calculations will be based on best available source of data:

$$FPj,t = BPj,t - MPj,t \quad (2)$$

Where:

FPj,t = Foregone production in the project area for commodity j in year t (units of production)
BPj,t = Baseline production in the project area for commodity j in year t (units of production)
MPj,t = Monitored production in the project area for up to five years after the project start date for commodity j in year t (units of production)
t = 1, 2, 3, …, t years elapsed since the project start date

**Table 21: Foregone production in the project area for commodity j in year t**

| | BPj,t | MPj,t | FPj,t |
|---|---|---|---|
| Wheat-5 | 117 258 | 1 768,65 | 64 876 |
| Soya-5 | 16 565 | 534,60 | 8 649 |
| Lentil-5 | 15 430 | 449,35 | 8 776 |
| Total-5 | 149 253 | 2 752,60 | 82 300 |

Step 2: Determine the impact of leakage mitigation activities
The project includes funding for leakage mitigation activities:

- Climate smart agriculture activities and trainings
- The water resources management aspect of the project is extending the cropping season (possibility for farmers to grow crops during the Zaid season)
- The planted fruit trees will generate a positive leakage

The impact of these activities will be monitored and accounted for with the use of equations (3), (4) and (5). In ex-ante calculations, these impacts have been conservatively set to 0.

Step 3: Determine amount of new land brought into production
The amount of new land that is brought into production outside the project area in year t is calculated as follows:

$$INLj,t = \frac{lj,t \times IS \times NLj}{yj,t} \quad (6)$$

Where:

$INL_{j,t}$ = Area of new land brought into production in year t (ha)
$l_{j,t}$ = Amount of foregone production subject to leakage for commodity j in year t (units of production). Conservatively, $l_{j,t}=FP_{j,t}$.

IS = Share of leakage resulting in increased supply outside the project area – a 0.75 (75 percent) for agricultural commodities default value has been used

$NL_j$ = Share of increased supply from new land brought into production for commodity j - a default value of 0.40 (40 percent) for agricultural commodities has been used

$y_{j,t}$ = Yield on new land brought into production for commodity j in year t (units of production/ha)

t = 1, 2, 3, …, t years elapsed since the project start date

**Table 22: Area of new land brought into production in year t (ha)**

| | PAI-1 |
|---|---|
| INLwheat-5 | 6 |
| INLsoya-5 | 2 |
| INLlentil-5 | 3 |
| $INL_{total-5} = AL_t$ | 11 |

Step 4: Determine change in carbon stocks in new lands brought into production

The new land brought into production is assumed to be forested land and is calculated as follows:

$$CS = \Delta Cbiomass + \Delta SOC \quad (8)$$

Where:

CS = Change in carbon stocks on new lands brought into production (t C/ha)

ΔCbiomass = Change in forest biomass carbon stocks equal to the in the regional average stock in which the project is located (t C/ha). A value of 73 t C/ha has been taken based on the IPCC Annex Table 3A.1.4 Average growing stock volume and aboveground biomass content in forest in 2000[45].

ΔSOC = Change in soil organic carbon (SOC) stocks in the region in which the project is located (t C/ha)

$$\Delta SOC = SOCREF \times (1.00 - fLU \times fMG \times fIN) \quad (9)$$

Where:

ΔSOC = Change in SOC stock in the area generating leakage emissions (t C/ha)

SOCREF = SOC stock corresponding to the reference condition in native ecosystems by climate region and soil type applicable to the land receiving the displaced activity (t C/ha). A value of 21 t C/ha has been used based on IPCC Chapter 2 Table 2.3 Default reference condition SOC[46].

[45] IPCC, Annex 3A.1 Biomass default tables for section 3.2 Forest land, < https://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf_files/Chp3/Anx_3A_1_Data_Tables.pdf>

[46] IPCC, 2019, Chapter 2 Generic methodologies applicable to multiple land-use categories, <https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch02_Generic%20Methods.pdf>

fLU, fMG, fIN = Relative SOC stock change factors over 20 years for land use, management practices and inputs respectively, applicable to the displaced production (dimensionless). Values have been taken from IPCC, Chapter 5 Table 5.5[47].

**Table 23: Change in carbon stocks in new lands brought into production**

| CS | ΔCbiomass (t/ha) | ΔSOC (tC/ha) |
|---|---|---|
| 46,5 | 41,5 | 4,96 |

Step 5: Determine leakage emissions

The leakage emissions from new land that is brought into production and where t does not exceed 5 years beyond the last project instance start date are calculated as follows:

$$LKt = ALt \times CS \times 44/12 \ (10)$$

Where:

$LK_t$ = Cumulative leakage up to year t (t CO2e)

$AL_t$ = Area generating leakage emissions in year t (ha)

CS = Change in carbon stocks on new lands brought into production (t C/ha)

t = 1, 2, 3, …, t years elapsed since the project start date, t must not exceed five years beyond the last project instance start date

44/12 = Conversion factor from C to CO2e

**Table 24: Cumulative leakage up to year 5 (t CO2e)**

| Year | Alt | CS | 44/12 | LKt |
|---|---|---|---|---|
| 0 | - | 46 | 3,67 | - |
| 1 | - | 46 | 3,67 | - |
| 2 | - | 46 | 3,67 | - |
| 3 | - | 46 | 3,67 | - |
| 4 | 11 | 46 | 3,67 | 1 851 |
| 5 | - | 46 | 3,67 | - |
| 6 | - | 46 | 3,67 | - |
| 7 | - | 46 | 3,67 | - |
| 8 | - | 46 | 3,67 | - |
| 9 | - | 46 | 3,67 | - |
| 10 | - | 46 | 3,67 | - |

## 4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

[47] IPCC, Chapter 5 Cropland, <https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch05_Cropland.pdf>

According to the methodology VM0047, section 8.5, the following equations are used to estimate the GHG emission removals of the project:

**Census-based quantification**

The first Project Activity Instance does not use the census-based quantification approach. However, for future PAIs, the project will apply the following equation to calculate carbon dioxide removals:

$$CR_t = \left(\Delta CWP, t \times (1 - UNCt)\right) - \left(\Delta CWP, t-1 \times (1 - UNCt-1)\right) - PEt \ (Equation\ 31)$$

Where:

CRt = Carbon dioxide removals from the project activity in year t (t CO2e)
ΔCWP,t = Project carbon stock change in year t (t CO2e)
PBt = Performance benchmark for the monitoring interval ending in year t (percent)
LKt = Leakage through year t (t CO2e)
PEt = Project emissions from biomass burning and fertilizer in year t (t CO2e)
UNCt = Uncertainty in cumulative removals through year t (percent)
t = 1, 2, 3, …, t years elapsed since the project start date

**Area-based quantification:**

$$CR_t = \left(\left(\Delta C_{WP,t} * (1 - PB_t) * (1 - UNC_t)\right) - LK_t\right) - PE_t$$
$$- \left(\left(\Delta C_{WP,t-1} * (1 - PB_{t-1}) * (1 - UNC_{t-1})\right) - PE_{t-1} - LK_{t-1}\right) \quad (Equation\ 30)$$

Where:

- $CR_t$ = Carbon dioxide removals from the project activity in year t (t CO2e)
- $\Delta C_{WP,t}$ = Project carbon stock change in year t (t CO2e)
- $PB_t$ = Performance benchmark for the monitoring interval ending in year t (percent)
- $LK_t$ = Leakage through year t (t CO2e)
- $PE_t$ = Project emissions from biomass burning and fertilizer in year t (t CO2e)
- $UNC_t$ = Uncertainty in cumulative removals through year t (percent)
- t = 1, 2, 3, …, t years elapsed since the project start date

A summary of the parameters calculated in section 4.1 to 4.4 are included in the following table:

| Year | $\Delta C_{WP,t}$ ($tCO_2e$) | $PB_t$ | $LK_t$ ($tCO_2e$) | PEt ($tCO_2e$) | $UNC_t$ | $CR_t$ ($tCO_2e$) |
|---|---|---|---|---|---|---|
| 1 | -270 | 1,15% | - | 8 | 10% | -248 |
| 2 | 669 | 1,15% | - | - | 10% | 843 |
| 3 | 2 452 | 1,15% | - | - | 10% | 1 587 |
| 4 | 8 765 | 1,15% | - | - | 10% | 5 616 |
| 5 | 12 066 | 1,15% | 1 851 | - | 10% | 1 085 |
| 6 | 15 947 | 1,15% | - | - | 10% | 5 304 |
| 7 | 20 596 | 1,15% | - | - | 10% | 4 136 |
| 8 | 25 833 | 1,15% | - | - | 10% | 4 659 |
| 9 | 31 840 | 1,15% | - | - | 10% | 5 344 |
| 10 | 38 345 | 1,15% | - | - | 10% | 5 787 |

**Table 25: Parameter Summary**

The estimated GHG emissions reductions and carbon dioxide removals have been calculated with the help of the equations mentioned in the section 4.1, 4.2 and 4.3. As per the VM0047 requirements described in "Section 8.6 Ex-Ante Estimations", an uncertainty deduction of 10% has been applied.

A non-permanence risk rating of 23% as been selected, based on a first draft of the non-permanence risk report:

| | |
|---|---|
| State the non-permanence risk rating (%) | 23% |
| Has the non-permanence risk report been attached as either an appendix or a separate document? | ☒ Yes ☐ No |
| For ARR and IFM projects with harvesting, state, in tCO2e, the Long-term Average (LTA). | N/A |
| Has the LTA been updated based on monitored data, if applicable? | ☐ Yes ☐ No<br>If no, provide justification. |
| State, in $tCO_2e$, the expected total GHG benefit to date. | N/A |
| Is the number of GHG credits issued below the LTA? | ☐ Yes ☐ No<br>If no, provide justification. |

| Vintage period | Estimated baseline emissions ($tCO_2e$) | Estimated project emissions ($tCO_2e$) | Estimated leakage emissions ($tCO_2e$) | Estimated buffer pool allocation ($tCO_2e$) | Estimated reduction VCUs ($tCO_2e$) | Estimated removal VCUs ($tCO_2e$) | Estimated total VCU issuance ($tCO_2e$) |
|---|---|---|---|---|---|---|---|
| 23-Jul-2023 to 31-Dec-2023 | -3 | 8 | - | -57 | 0 | -191 | -191 |
| 01-Jan-2024 to 31-Dec-2024 | 8 | - | - | 194 | 0 | 649 | 649 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 01-Jan-2025 to 31-Dec-2025 | 28 | - | - | 365 | 0 | 1 222 | 1 222 |
| 01-Jan-2026 to 31-Dec-2026 | 101 | - | - | 1 292 | 0 | 4 324 | 4 324 |
| 01-Jan-2027 to 31-Dec-2027 | 139 | - | 1 851 | 250 | 0 | 835 | 835 |
| 01-Jan-2028 to 31-Dec-2028 | 183 | - | - | 1 220 | 0 | 4 084 | 4 084 |
| 01-Jan-2029 to 31-Dec-2029 | 237 | - | - | 951 | 0 | 3 184 | 3 184 |
| 01-Jan-2030 to 31-Dec-2030 | 297 | - | - | 1 072 | 0 | 3 588 | 3 588 |
| 01-Jan-2031 to 31-Dec-2031 | 366 | - | - | 1 229 | 0 | 4 115 | 4 115 |
| **Total** | **1 797** | **8** | **1 851** | **7 846** | **0** | **26 267** | **26 267** |

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

| Data / Parameter | A |
|---|---|
| Data unit | Ha |
| Description | Project area |
| Source of data | Handheld GIS or aerial photography will be used to develop ARR establishment polygons. Establishment polygons will be aggregated using a GIS package |
| Value applied | 591.5 Ha for the first project activity instance |
| Justification of choice of data or description of measurement methods and procedures applied | Following VM0047, delineation of the project area may use a combination of GIS coverages, ground survey data with GPS, remote imagery (satellite or aerial photographs) or other appropriate data. Any imagery or GIS datasets used must be geo-registered referencing corner points, clear landmarks or other intersection points |
| Purpose of data | Calculation of project emissions using area-based quantification approach<br>Calculation of leakage emissions using area-based quantification approach |
| Comments | The project proponent will be adding activity instances that will be summarized in this parameter. |

| Data / Parameter | R |
|---|---|
| Data unit | Dimensionless |
| Description | Root to shoot ratio (i.e., ratio of belowground (root) biomass to aboveground biomass, per unit area or per stem) |
| Source of data | Global values specific to the forest type (Tropical Dry Asia <125 tonnes/ha) from Table 4.4 in Chapter 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. |
| Value applied | 0.440 |
| Justification of choice of data or description of measurement methods and procedures applied | Following VM0047, For project activities involving facilitated regeneration or with more than two species in a single stand, R must be chosen from the following as available [...] b) Global values specific to the forest type (e.g., from Table 4.4 in |

| | |
|---|---|
| | Chapter 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | None |

| | |
|---|---|
| Data / Parameter | CF |
| Data unit | t C / t d.m. |
| Description | Carbon fraction of dry biomass |
| Source of data | IPCC 2006 Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.47 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | None |

| | |
|---|---|
| Data / Parameter | N |
| Data unit | Integer |
| Description | Initial population size (number of planting units) |
| Source of data | Complete census/ enumeration |
| Value applied | 0 for the first project activity instance |
| Justification of choice of data or description of measurement methods and procedures applied | Following VM0047, the original population size, N, is established via administering and recording an initial complete census of all planting units. For each planting unit, the following must be recorded:<br>• Unique ID<br>• Geo-referenced point of the location<br>• Year planted<br>• Species |

| | |
|---|---|
| Purpose of data | Calculation of project emissions using census-based quantification approach |
| Comments | The planting unit is a tree |

| | |
|---|---|
| Data / Parameter | $EF_{Ndirect}$ |
| Data unit | t N2O-N/t N applied |
| Description | Emission factor for direct nitrous oxide emissions from N additions due to synthetic fertilizers, organic amendments and crop residues |
| Source of data | Table 11.1, Chapter 11 in Volume 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | Used for emissions of the following fertilizers: Vermicompost, neem oilcake. |

| | |
|---|---|
| Data / Parameter | $Frac_{GASM}$ |
| Data unit | Dimensionless |
| Description | Fraction of all organic N added to soils that volatilizes as NH3 and NOX |
| Source of data | Table 11.3, Chapter 11 in Volume 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.21 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |

| | |
|---|---|
| Comments | Used for emissions of the following fertilizers: Vermicompost, neem oilcake. |

| | |
|---|---|
| Data / Parameter | $EF_{Nvolat}$ |
| Data unit | t N2O-N/t NH3-N + NOx-N volatilized |
| Description | Emission factor for nitrous oxide emissions from atmospheric deposition of N on soils and water surfaces |
| Source of data | Table 11.3, Chapter 11 in Volume 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.01 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | Used for emissions of the following fertilizers: Vermicompost, neem oilcake. |

| | |
|---|---|
| Data / Parameter | $Frac_{LEACH}$ |
| Data unit | Dimensionless |
| Description | Fraction of synthetic or organic N added to soils that are lost through leaching and runoff |
| Source of data | Table 11.3, Chapter 11 in Volume 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.24 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | Used for emissions of the following fertilizers: Vermicompost, neem oilcake. |

| | |
|---|---|
| Data / Parameter | $EF_{NIeach}$ |
| Data unit | t N2O-N/t N leached and runoff |
| Description | Emission factor for nitrous oxide emissions from leaching and runoff |
| Source of data | Table 11.3, Chapter 11 in Volume 4 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Value applied | 0.011 |
| Justification of choice of data or description of measurement methods and procedures applied | Imposed by the VM0047 methodology |
| Purpose of data | Calculation of project emissions using area-based approach or census-based quantification approach |
| Comments | Used for emissions of the following fertilizers: Vermicompost, neem oilcake. |

| | |
|---|---|
| Data / Parameter | $P_{j,h}$ |
| Data unit | Kg/ha |
| Description | Production in the project area for commodity j in year h of the historical reference period |
| Source of data | National average values derived from census data (FAOStat data) |
| Value applied | FAOStat data on national average production (in kgs/ha) for 2020,2021 and 2022 for the main commodities grown in the area: |

| | National average (FAOSTAT data) |
|---|---|
| 2022 Wheat | 3,537 kgs/ha |
| 2021 Wheat | 3,521 kgs/ha |
| 2020 Wheat | 3,440 kgs/ha |
| 2022 Soyabean | 1,069 kgs/ha |
| 2021 Soya bean | 976 kgs/ha |
| 2020 Soya bean | 921 kgs/ha |
| 2022 Lentil | 899 kgs/ha |
| 2021 Lentil | 1,017 kgs/ha |
| 2020 Lentil | 847 kgs/ha |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Following VMD0054, where historical production records for the project area and regional (sub-national) average values do not exist, national average values derived from census data must be used. |

| | |
|---|---|
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Comments | |

| | |
|---|---|
| Data / Parameter | H |
| Data unit | Years |
| Description | Number of years within historical reference period used to determine baseline production within the project area |
| Source of data | N/A |
| Value applied | 3 |
| Justification of choice of data or description of measurement methods and procedures applied | One complete crop rotation is one year in the project area. |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $Op_{j,h}$ |
| Data unit | Kg/ha |
| Description | Production units of commodity j in the leakage mitigation area in year h of the historical reference period |
| Source of data | N/A |
| Value applied | 0 |
| Justification of choice of data or description of measurement methods and procedures applied | Conservatively selecting zero for leakage mitigation production at validation. |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Comments | None |

## 5.2 Data and Parameters Monitored

| | |
|---|---|
| **Data / Parameter** | Mt |
| **Data unit** | Percent |
| **Description** | Mortality through year t |
| **Source of data** | Complete re-enumeration |
| **Description of measurement methods and procedures to be applied** | Depending on technical feasibility, the following methodologies will be employed:<br>• In-field re-enumeration, data will include at least geotagging and status (dead/alive)<br>• Drones<br>• Satellite imagery |
| **Frequency of monitoring/recording** | At least every 5 years |
| **Value applied** | To be updated for the verification |
| **Monitoring equipment** | • Android phones with KoboTool Box or ODK Collect apps, QGIS<br>• Photogrammetric UAV, QGIS<br>• Landsat 8/ Sentinel 2 imagery, QGIS |
| **QA/QC procedures to be applied** | QA/QC procedures will be outlined in standard operating procedures governing field data collection |
| **Purpose of data** | Calculation of project emissions for the census-based quantification approach |
| **Calculation method** | Calculated as a percentage of census |
| **Comments** | Provide any additional comments |

| | |
|---|---|
| **Data / Parameter** | $C_{WP\text{-}woody\text{-}AB,t}$ |
| **Data unit** | t C/ha |
| **Description** | Average aboveground woody biomass stocks in the project scenario in year t (area-based quantification) |
| **Source of data** | Field measurement |
| **Description of measurement methods** | Following VM0047, Aboveground woody biomass will be measured via plot-based sampling. Sampling based on 1) the |

| | |
|---|---|
| and procedures to be applied | planting model or land tenure type, 2) annual cohort will be applied.<br>Aboveground woody biomass of each sampled woody plant (e.g., tree, shrub) is estimated using published allometric equations applied to one or more measured attributes specific to the species within the same ecoregion or Holdridge life-zone as the region when available or equations specific to the forest type within the same ecoregion or Holdridge life zone.<br>Attributes (diameter at breast height, total height) incorporated as independent variables in allometric equations are directly measured in the field applying established best practices |
| Frequency of monitoring/recording | At least every 5 years |
| Value applied | To be updated for the verification |
| Monitoring equipment | • Calipers or metric/diametriuc measuring tape (DBH)<br>• Suunto height meter (total height)<br>• Android phones with KoboTool Box or ODK Collect apps |
| QA/QC procedures to be applied | QA/QC procedures will be outlined in standard operating procedures governing field data collection |
| Purpose of data | Calculation of project emissions for the area-based quantification approach |
| Calculation method | Live above ground biomass per hectare for each measurement stratum is calculated using the following process:<br>• Establish a representative sample of monitoring plot for verification event<br>• Measure DBH per species for each monitoring plot<br>• Measure height per species for each monitoring plot<br>• Use a species-appropriate allometric equation or volumetric equation to calculate total biomass per species per monitoring plot<br>• Sum total biomass for monitoring plot<br>• Convert total biomass per monitoring plot to biomass per hectare |
| Comments | Calculated as average of sample measurements<br>Species-specific allometric equations or volumetric equations will be used for estimating above ground biomass. This will also include species-specific wood density factors, and biomass expansion factors that can come from sources such as: |

| | |
|---|---|
| | World Agroforestry database for wood density: http://db.worldagroforestry.org//wd/species<br>Biomass Expansion Factor (BEFj):<br>Biomass default table 3A.1.10 (BEF 1(overbark)) for forest land, LULUCF, IPCC guidelines |

| | |
|---|---|
| **Data / Parameter** | $B_{WP\text{-}woody\text{-}AB,t}$ |
| **Data unit** | t d.m. |
| **Description** | Estimated biomass stock in aboveground woody biomass in sampled planting unit pu in the project scenario in year t (census-based quantification) |
| **Source of data** | Field measurement |
| **Description of measurement methods and procedures to be applied** | Following VM0047, Aboveground woody biomass will be measured via representative sampling from N planting units. Sampling is based at least on annual cohorts.<br>Aboveground woody biomass of each sampled woody plant (e.g., tree, shrub) is estimated using published allometric equations applied to one or more measured attributes specific to the species within the same ecoregion or Holdridge life-zone as the region when available or equations specific to the forest type within the same ecoregion or Holdridge life zone.<br>Attributes (diameter at breast height, total height) incorporated as independent variables in allometric equations are directly measured in the field applying established best practices |
| **Frequency of monitoring/recording** | At least every 5 years |
| **Value applied** | $B_{WP\text{-}woody\text{-}AB,t}$ is expected to be 0 t d.m. in year 30 for the first project activity instance |
| **Monitoring equipment** | • Calipers or metric/diametriuc measuring tape (DBH)<br>• Suunto height meter (total height)<br>• Android phones with KoboTool Box or ODK Collect apps |
| **QA/QC procedures to be applied** | QA/QC procedures will be outlined in standard operating procedures governing field data collection |
| **Purpose of data** | Calculation of project emissions for the census-based quantification approach |

| | |
|---|---|
| **Calculation method** | Live above ground biomass per planting unit for each measurement stratum is calculated using the following process:<br>• Establish a representative sample of planting unit for verification event<br>• Measure DBH per species for each planting unit<br>• Measure height per species for each planting unit<br>• Use a species-appropriate allometric equation or volumetric equation to calculate total biomass per species per planting unit<br>• Convert total biomass per planting unit to total planting unit using N and Mt |
| **Comments** | Calculated as average of sample measurements<br>Species-specific allometric equations or volumetric equations will be used for estimating above ground biomass. This will also include species-specific wood density factors, and biomass expansion factors that can come from sources such as:<br>World Agroforestry database for wood density: http://db.worldagroforestry.org//wd/species<br>Biomass Expansion Factor (BEFj):<br>Biomass default table 3A.1.10 (BEF 1(overbark)) for forest land, LULUCF, IPCC guidelines |

| | |
|---|---|
| **Data / Parameter** | $n_{burn,t}$ |
| **Data unit** | Integer |
| **Description** | Number of sampled planting units recorded as burned in the monitoring |
| **Source of data** | Field sampling |
| **Description of measurement methods and procedures to be applied** | Following VM0047, With census-based quantification, measured via representative sampling from N planting units, tallying each visibly burned and killed planting unit. |
| **Frequency of monitoring/recording** | At least every 5 years |
| **Value applied** | $n_{burn,t}$ is expected to be 0 after 40 years. |
| **Monitoring equipment** | Android phones with KoboTool Box or ODK Collect apps |

| | |
|---|---|
| QA/QC procedures to be applied | QA/QC procedures will be outlined in standard operating procedures governing field data collection |
| Purpose of data | Calculation of project emissions for the census-based quantification approach |
| Calculation method | Count (not calculated) |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $U_{p,t}$ |
| Data unit | Percent |
| Description | Percentage uncertainty (expressed as 90 percent confidence interval as a percentage of the mean) in carbon stock estimate of pool p in the project scenario in year t |
| Source of data | Calculation from sampled field measurement |
| Description of measurement methods and procedures to be applied | Following VM0047, Uncertainty in pools derived from field measurements with 90 percent confidence interval calculated as the standard error of the averaged plot measurement multiplied by the t value for the 90 percent confidence level. |
| Frequency of monitoring/recording | At least every 5 years |
| Value applied | $U_{p,t}$ is conservatively set to 10%in ex-ante calculations and will be calculated ex-post |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | QA/QC procedures will be outlined in standard operating procedures governing field data collection |
| Purpose of data | Calculation of project emissions for the census-based and area-based quantification approach |
| Calculation method | Confidence interval calculated by applying unbiased estimators appropriate to sample design |
| Comments | Applied to all pools |

| | |
|---|---|
| **Data / Parameter** | $A_{burn,t}$ |
| **Data unit** | ha |
| **Description** | Area burned in the monitoring interval ending in year t |
| **Source of data** | Calculated from GIS data |
| **Description of measurement methods and procedures to be applied** | Following VM0047, delineation of the area burned may use a combination of remote imagery (satellite or aerial photographs) or ground survey data with GPS. |
| **Frequency of monitoring/recording** | At least every 5 years |
| **Value applied** | $A_{burn,t}$ is expected to be 0 in year 40 |
| **Monitoring equipment** | • Android phones with KoboTool Box or ODK Collect apps<br>• QGIS and relevant datasets |
| **QA/QC procedures to be applied** | Any imagery used must be geo-registered referencing corner points, clear landmarks or other intersection points. |
| **Purpose of data** | Calculation of project emissions for the area-based quantification approach |
| **Calculation method** | Calculated using GIS |
| **Comments** | None |

| | |
|---|---|
| **Data / Parameter** | $M_{wp,OF,t}$ |
| **Data unit** | t fertilizer |
| **Description** | Mass of N-containing organic fertilizer applied in the project scenario in the monitoring interval ending in year t |
| **Source of data** | Records of fertilizer purchased and used in the project area. |
| **Description of measurement methods and procedures to be applied** | The quantify of organic fertilizers (vermi-compost, neem oil cake) used per tree on an annual basis ($M_{wp,OF,t}$). This data, in line with methodological requirements, will be collected from management records of implementation partners on the ground. |

| | |
|---|---|
| Frequency of monitoring/recording | At least every 5 years |
| Value applied | $M_{wp,OF,t}$ is expected to be 16 833 t in year 30 |
| Monitoring equipment | Record-keeping of fertilizer purchased and corresponding weights |
| QA/QC procedures to be applied | Any quantitative information (e.g., discrete or continuous numeric variables) on management practices must be supported by one or more forms of documented evidence pertaining to the project and relevant monitoring period (e.g., management logs, receipts or invoices). |
| Purpose of data | Calculation of project emissions for the census-based and area-based quantification approach |
| Calculation method | Calculated ex-post |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $NC_{wp,OF,t}$ |
| Data unit | T N/t fertilizer |
| Description | N content of organic fertilizer applied in the project in year t |
| Source of data | Peer-reviewed data from published scientific articles: |
| Description of measurement methods and procedures to be applied | Vermicompost = 1.34%<br>Neem oilcake = 2.50%<br>Peer-reviewed scientific journals are a reputable source for estimating the N content of organic fertilizer that is locally used. |
| Frequency of monitoring/recording | At verification event |
| Value applied | Peer-reviewed scientific journals are a reputable source for estimating the N content of organic fertilizer that is locally used. |
| Monitoring equipment | *N/A* |
| QA/QC procedures to be applied | Data referenced must be published or peer-reviewed. |

| | |
|---|---|
| **Purpose of data** | Calculation of project emissions for the census-based and area-based quantification approach |
| **Calculation method** | Not calculated |
| **Comments** | None |

| | |
|---|---|
| **Data / Parameter** | $SI_{control,t}$ and $SI_{wp,t}$ |
| **Data unit** | Unspecified |
| **Description** | Stocking index in scenario ( control plot j or project plot i) at time |
| **Source of data** | Annual normalized difference vegetation index (NDVI) composites obtained from satellite images captured during the dry season months (April to May) from Landsat-8 images taken between 2015 and 2023<br><br>The dry season period was chosen in order to achieve images with less cloud coverage and minimize variability arising from seasonality. This period coincides also with minimal seasonal and inter-annual phenological variation. This period is optimum for analysis of passive remote sensor data.<br><br>Further information provided in Section 3.4 |
| **Description of measurement methods and procedures to be applied** | See Section 3.4 |
| **Frequency of monitoring/recording** | The control unit selection occurs once.<br>The monitoring occurs annually. |
| **Value applied** | See Section 3.4 for further information |
| **Monitoring equipment** | Selection of control plots and derivation of performance benchmark for the area-based approach. |
| **QA/QC procedures to be applied** | $$SI_1 = \frac{\rho_{865} - \rho_{660}}{\rho_{865} + \rho_{660}}$$<br><br>$SI_2 = f(\theta, \rho_{492}, \rho_{560}, \rho_{665}, \rho_{704}, \rho_{741}, \rho_{783}, \rho_{833}, \rho_{865}, \rho_{1614}, \rho_{2202})$<br><br>with |

| | |
|---|---|
| | $\rho_{nm}$ : bottom-of-atmosphere spectral reflectance at the indicated wavelength (in nanometer)<br>f: non-linear neural network function<br>$\theta$: parameters of the neural network learned during training |
| **Purpose of data** | Calculation of baseline emissions for area-based quantification approach |
| **Calculation method** | Annual normalized difference vegetation index (NDVI) composites obtained from satellite images captured during the dry season months (April to May) from Landsat-8 images taken between 2015 and 2023<br><br>The dry season period was chosen in order to achieve images with less cloud coverage and minimize variability arising from seasonality. This period coincides also with minimal seasonal and inter-annual phenological variation. This period is optimum for analysis of passive remote sensor data.<br><br>Further information provided in Section 3.4 |
| **Comments** | See Section 3.4 |

| | |
|---|---|
| **Data / Parameter** | $MP_{j,t}$ |
| **Data unit** | Kg/ha |
| **Description** | Monitored production in the project area for commodity j in year t |
| **Source of data** | Grower records, or remotely sensed data (e.g., satellite imagery, manned aerial vehicle footage, drone imagery) where it is possible to reliably determine the requisite information on production using these methods |
| **Description of measurement methods and procedures to be applied** | N/A |
| **Frequency of monitoring/recording** | At each monitoring event |
| **Value applied** | |

| Variable | Value | Source |
|---|---|---|
| **MPwheat (kg/ha)** | 1 768,65 | Assuming 50% production in Monitoring Period |

| | | | | |
|---|---|---|---|---|
| | | **Mpsoya (kg/ha)** | 534,60 | Assuming 50% production in Monitoring Period |
| | | **Mplentil (kg/ha)** | 449,35 | Assuming 50% production in Monitoring Period |
| **Monitoring equipment** | N/A | | | |
| **QA/QC procedures to be applied** | N/A | | | |
| **Purpose of data** | Calculation of leakage emissions for area-based quantification approach | | | |
| **Calculation method** | N/A | | | |
| **Comments** | None | | | |

| | |
|---|---|
| **Data / Parameter** | $r_j$ |
| **Data unit** | Percent |
| **Description** | Annual growth rate of yield for commodity j |
| **Source of data** | VM0047 default value |
| **Description of measurement methods and procedures to be applied** | N/A |
| **Frequency of monitoring/recording** | At each monitoring event |
| **Value applied** | 2.5% |
| **Monitoring equipment** | N/A |
| **QA/QC procedures to be applied** | N/A |
| **Purpose of data** | Calculation of leakage for the area-based quantification approach |

| | |
|---|---|
| Calculation method | N/A |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $OMP_{j,t}$ |
| Data unit | Kg/ha |
| Description | Monitored production in the leakage mitigation area for commodity j in year t |
| Source of data | Grower records, or remotely sensed data (e.g., satellite imagery, manned aerial vehicle footage, drone imagery) where it is possible to reliably determine the requisite information on production using these methods |
| Description of measurement methods and procedures to be applied | N/A |
| Frequency of monitoring/recording | At each monitoring event. |
| Value applied | Conservatively set to 0 in the ex-ante calculations |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | Measurement and QA/QC procedures will be detailed in standard operating procedures. |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |
| Comments | None |

| | |
|---|---|
| Data / Parameter | IS |
| Data unit | Percent |
| Description | Share of leakage resulting in increased supply outside the project area |

| | |
|---|---|
| Source of data | Default value from VMD0054 “Module for Estimating Leakage from ARR activities” for agricultural commodities |
| Description of measurement methods and procedures to be applied | N/A |
| Frequency of monitoring/recording | At each monitoring event. |
| Value applied | 0.75 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $NL_j$ |
| Data unit | Percent |
| Description | Share of increased supply from new land brought into production for commodity j |
| Source of data | Default value from VMD0054 “Module for Estimating Leakage from ARR activities” for agricultural commodities |
| Description of measurement methods and procedures to be applied | N/A |
| Frequency of monitoring/recording | At each verification event. |
| Value applied | 0.40 |
| Monitoring equipment | N/A |

| | |
|---|---|
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $y_{j,t}$ |
| Data unit | *Kg/ha/year* |
| Description | Yield on new lands brought into production for commodity j in year t |
| Source of data | For crop commodities, data from FAOSTAT will be used where official government statistics or published studies are not available. Where none of the above sources of data area available, or for subsistence commodities, yield in the project area during the historical reference period may be used. |
| Description of measurement methods and procedures to be applied | Data from the year closest to that for which leakage emissions are being calculated must be used. |
| Frequency of monitoring/recording | At each verification event. |
| Value applied | **Variable** / **Value** / **Source**<br>**Ywheat** / 3 537 / FAO Stat (2022 Data)<br>**Ysoya** / 1 069 / FAO Stat (2022 Data)<br>**Ylentil** / 899 / FAO Stat (2022 Data) |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |

| | |
|---|---|
| **Comments** | None |

| | |
|---|---|
| **Data / Parameter** | $\Delta C_{biomass}$ |
| **Data unit** | t C/ha |
| **Description** | The change in forest biomass carbon stocks equal to the regional average stock where the project is located |
| **Source of data** | Derived from table 3A.1.4 of the IPCC Good Practice Guidance for Land Use, Land-use Change and Forestry (IPCC 2003) |
| **Description of measurement methods and procedures to be applied** | If biomass is presented in tonnes of dry biomass per hectare, then carbon stocks should be determined using a carbon fraction default value of 0.47.<br>Belowground biomass stocks are estimated using allometric equations contained in Table 4.A.4 of the IPCC (2003). The tropical forest conditions were selected as follows:<br>BGB = exp{-1.05787 + 0.8836*ln(ABG)}<br>As the data presented include tree biomass only, the carbon stocks in deadwood and litter are estimated by multiplying the sum of aboveground and belowground biomass stocks by a factor of 1.1 according to the CDM AR-TOOL15, v2.0. |
| **Frequency of monitoring/recording** | At each verification event. |
| **Value applied** | 41.5 |
| **Monitoring equipment** | N/A |
| **QA/QC procedures to be applied** | N/A |
| **Purpose of data** | Calculation of leakage for the area-based quantification approach |
| **Calculation method** | N/A |
| **Comments** | None |

| | |
|---|---|
| **Data / Parameter** | $SOC_{REF}$ |
| **Data unit** | t C/ha |

| | |
|---|---|
| Description | Soil Organic Carbon (SOC) stock corresponding to the reference condition in native ecosystems by climate region and soil type applicable to the land receiving the displaced activity |
| Source of data | Table 2.3 of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Description of measurement methods and procedures to be applied | Condition selected for tropical wet Climate Zone and sandy soils. |
| Frequency of monitoring/recording | At each verification event. |
| Value applied | 21 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |
| Comments | None |

| | |
|---|---|
| Data / Parameter | $f_{LU}$,$f_{MG}$, $f_{IN}$ |
| Data unit | Dimensionless |
| Description | Relative SOC stock change factors applicable to the displaced production over 20 years for land use, management practices and inputs respectively |
| Source of data | Table 5.5 (displaced crops, referencing tree crops in the case of fuelwood) of the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories |
| Description of measurement methods and procedures to be applied | All three factors were selected based on the Tropical Wet temperature and moisture regime, combined with the full tillage and low input level on the crops. |

| | |
|---|---|
| Frequency of monitoring/recording | At each verification event. |
| Value applied | fLU = 0.83<br>fMG = 1.00<br>fIN = 0.92 |
| Monitoring equipment | N/A |
| QA/QC procedures to be applied | N/A |
| Purpose of data | Calculation of leakage for the area-based quantification approach |
| Calculation method | N/A |
| Comments | None |

## 5.3 Monitoring Plan

**Specification of the quantification approach applied and accounting boundaries**

Data will be measured and collated during each monitoring period to meet the data validation and verification requirements of the VCS standard. The data and parameters to be monitored are dependent on the quantification approach applied. The project uses the area-based quantification approach for the first project activity instance but intends to utilise both area-based and census-based quantification approaches:

- Census-based quantification will be employed on areas of planting as per the applicability conditions (Section 4) of VM0047 v1.0. The planting unit under the census-based quantification approach is a tree. A 10-meter radius buffer around the recorded GPS location of each planting unit will be maintained and visualized through GIS to ensure accounting boundaries do not overlap when area-based and census-based approaches are used in the same project.
- Area-based quantification will be applied notably in areas that produce continuous tree cover on contiguous areas exceeding one hectare

**Data and parameters to be measured**

All data and parameters to be monitored are detailed in the excel spreadsheet “Panna monitoring plan”. The spreadsheet includes the data collection technique, sampling intensity, the description of the estimator of the population parameter, the data collection frequency, QA/QC and data archiving procedure.

**Description of monitoring tasks**

All data and parameters to be measured will be collected through the following monitoring event:

*Planting reconciliation*

Planting parameters (project area (A) for the area-based quantification approach and initial population size (N) for the census-based quantification approach) are recorded through Kobo Toolbox (including handheld GIS). The accuracy and completeness of data is checked both by CIP and Haritika's teams in the field and on GIS.

*Monitoring*

Mortality audit is performed between 6 and 18 months of tree planting. The minimum sampling intensity required for 90% confidence level and 10% margin of error is performed. Mortality is then recorded at least for each verification event. This procedure will be repeated for each new planting unit. The mortality cause will be distinct in fire or not-fire induced for the purpose of monitoring as specified in VM0047. Loss due to fire will also be recorded whenever an incident alert related to fire is received.

*Biomass inventory*

As required by the VCS Standard, number of sample plots for estimating biomass and forest carbon must be determined such that the error in estimation is below 10% of the mean at each stratum at 95% confidence level. The project will follow best sample and biomass inventory practices from "CDM, A/R Methodological Tool – Calculation of the number of sample plots for measurements within A/R CDM project activities"[48] and "VCS module, VMD0001 Estimation of carbon stocks in the above- and belowground biomass in live tree and non-tree pools"[49]. CIP has also developed a Standard Operating Procedure for biomass inventories that will be used and improved as needed.

*Annual stocking index*

All details on the stocking index and the process to derive it are available in Section 3.4 of the PDD. A database is available for the first PAI and contains a list of project plots and a list of control plots.

*Agriculture and leakage*

As mentioned in Section 4.3, the methodological approach monitoring of agricultural production in the project area and resulting leakage emissions, as well as the impact of leakage mitigation activities is yet to be developed. This will be fully operational before the first project verification round.

[48] < https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-03-v2.1.0.pdf>

[49] < https://verra.org/wp-content/uploads/2023/11/VMD0001-Estimation-of-Carbon-Stocks-in-Above-and-Belowground-Biomass-in-Live-Tree-and-Non-tree-Pools-CP-AB-v1.2.pdf>

# APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

No commercially sensitive information has been included in the project description.

# APPENDIX 2: STAKEHOLDER IDENTIFICATION

This Appendix outlines the process followed to identify stakeholders, in accordance with the SBIA stakeholder identification steps.

**Step-1: Identify Stakeholders through focused Group Discussion with key or focus groups to list and classify stakeholders**

The initial location for project implementation is within the rural areas of Panna, Chhatarpur, Katni & Damoh District. We have identified the communities in these districts as stakeholders in the project.

Additional groups that may be impacted or have influence on the project have also been included as follows:

1. Local communities: Residents of the villages who may be directly impacted by land-use changes and benefit from environmental improvements. This will include women, small & marginal farmers and Community institutions (VDC, CIG etc.).

2. Government authorities: including local government officials (Secretary, Sarpanch, Ward members etc.) and forest departments responsible for permits, regulations, and support.

3. Environmental NGOs/ Institutions: Organizations focused on conservation and sustainability like KVK, CAFRI, Grassland Institute etc. that may provide technical expertise and advocacy.

4. Agricultural cooperatives/ Producer Groups: Representing local farmers who may be involved in tree planting or agroforestry activities like the Bhimkund Agriculture Producer Company, Producer Groups formed under SRLM and Cluster level federations.

5. Private landowners: Individuals or entities owning land in the project area.

6. Researchers and scientists: Academic institutions and experts interested in studying the environmental impacts of the project.

**Step 2: Categorize stakeholders into primary (directly impacted) and secondary (indirectly impacted) groups**

Primary stakeholders typically have a more significant influence on the project's success and are directly affected by its outcomes, the identified stakeholders were split into 2 groups as follows:

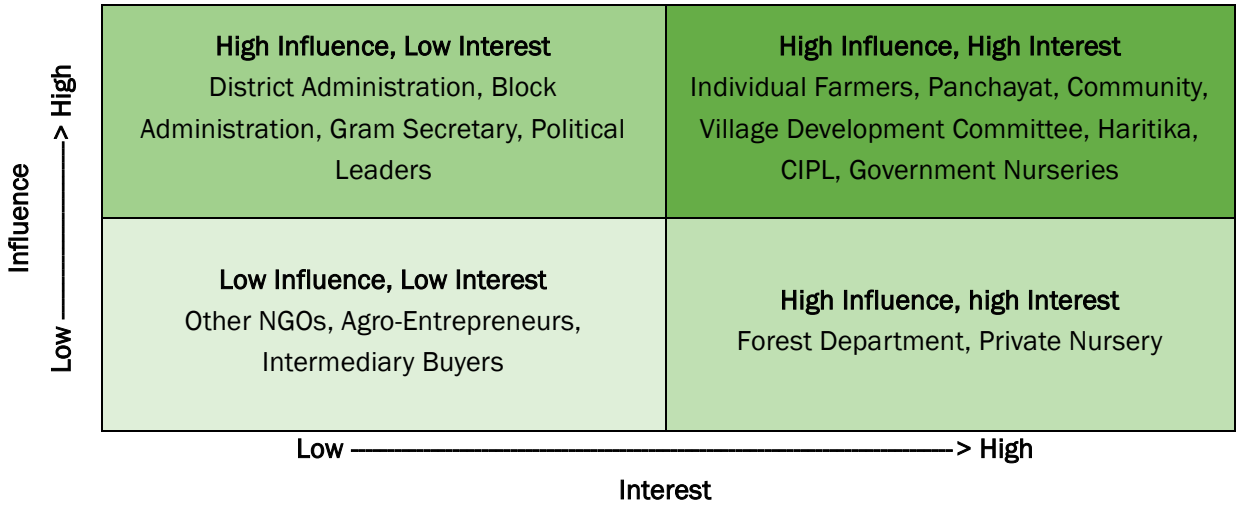
| | |
|---|---|
| **Primary Stakeholders** | **Farmers (Small, Marginal & a few large), Women Entrepreneurs, Community of the village, Private Landowners, HARITIKA & CIP UK** |

| | |
|---|---|
| **Secondary Stakeholders** | Village Community Institutions, Local government officials, Agricultural cooperatives/ Producer Groups, Environmental NGOs/ Institutions, Researchers, and scientists |

**Step 3: Assess Interest and Influence**

For each identified stakeholder type, the implementing partner has assessed their level of interest in the project and their degree of influence on the project outcomes. This can be done using a matrix with the X-axis representing influence and the Y-axis representing interest.

- **High Influence, High Interest:** These are the key stakeholders who need to be closely engaged and managed. They have both the power and the motivation to affect the project significantly.
- **High Influence, Low Interest:** While they have the power to influence, they may not be highly motivated by the project. It's important to keep them informed and engaged periodically.
- **Low Influence, High Interest:** These stakeholders may not have much power, but they are genuinely interested in the project. Consider ways to keep them informed and involved to maintain their support.
- **Low Influence, Low Interest:** These stakeholders have limited impact potential and interest, but it's still essential to monitor their positions.




**Step 4: Analyse each stakeholder group in terms of their interests, motivation to participate and relationships with other stakeholders**

Benefits of Stakeholder Mapping: According to content of the step 1, the stakeholder analysis can be summarized in the below table:

| Stakeholder subgroup | Stakeholders | Current Situation | Interests, motivation in the project /Effect of project on their interest(s) |
|---|---|---|---|

| | | | |
|---|---|---|---|
| **Communities of Project Areas (Villages of Panna, Chhatarpur & Damoh District)** | Women entrepreneurs and women-focused community institutions | No income source nearby village, if work as labour, then discrimination in wages, no involvement in decision making either in family or in community | Through establishment of NMPM Unit, Nursery and PGs/CLF/VO involvement in O & M block plantation sites; Financially empowered women and increased leadership & decision-making power |
| | Tribal communities | They are completely dependent on NTFPs for their income for which they are compelled to take NTFPs from forest on which they have very limited rights. | Under the NTFP & medicinal plantation model on community land the tribal families will have all the usufructuary rights so they will have increased income with safety. |
| | Individual farmers / migrant labourers | Due to lack of water for irrigation, less soil fertility & technology availability; Small & marginal farmers are completely dependent on single crops (kharif) the income of which does not cover annual living costs resulting in the need to migrate to generate more income. | Along with crop-diversification through horticulture plantation; construction of WHS, arrangement for solar water pumping, training & capacity building activities and application of bio-stimulants for soil improvement will improve their income & productivity as well as make their land fertile and hence reduce migration. |
| **Community Based Institutions** | Village Development Committees (VDCs) | There are no village development committees currently active within the project boundary | Creation of VDCs that are separate from panchayat will enable and empower communities through the engagement and management of community funds created through the shared carbon revenue of the project. |
| | Farmer producer organisations (FPOs) / Producer groups (PGs) | Currently FPO & PGs are formed but not operational | The project, intends to work with FPOs and PGs by providing capacity building in areas such as Climate Smart Agriculture to benefit local producers. |
| **Government Authority** | Gram Panchayat | At present the government focus is on climate change and | By actively supporting the project local government will see a positive impact within their communities by |

| | | | |
|---|---|---|---|
| | / Secretary / Block / District Administration | environment protection using government funding. | supporting the use of private finance to aid afforestation. |
| | Forest Development | Predominately focused on forestry protection | By working alongside the project, the forest department benefits from afforestation with an increase in biodiversity throughout the project area. |
| **Other Stakeholders** | Training institutes / NGOs | NGOs are working on education programmes within the project boundary | The project will bring in additional finance to support our NGO implementing partner, enabling an expansion of their education and training programmes. |
| | Government / private nursery operators and other vendors | Local businesses already active within the local area. | The project will bring more demand for tree species and other equipment which will increase opportunities and the economy in the local area. |

# APPENDIX 3: OVERVIEW OF STAKEHOLDER CONSULTATION MEETINGS

| | District | Village Name | Meeting dates |
|---|---|---|---|
| 1 | Chhatarpur | Surajpura Khurd | 10-May-23 |
| 2 | Chhatarpur | Kasar | 11-May-23 |
| 3 | Bijawar | Satai | 15-May-23 |
| 4 | Bijawar | Pagara | 16-May-23 |
| 5 | Bijawar | Malguwan | 21-May-23 |
| 6 | Satna | Ramnagar | 22-May-23 |
| 7 | Chhatarpur | Narayanpura | 23-May-23 |
| 8 | Chhatarpur | Baxoi | 26-May-23 |
| 9 | Chhatarpur | Gulganj | 29-May-23 |
| 10 | Satna | Majhguwan | 30-May-23 |
| 11 | Bijawar | Matipura | 02-Jun-23 |
| 12 | Chhatarpur | Patna | 03-Jun-23 |
| 13 | Chhatarpur | Tapran | 05-Jun-23 |
| 14 | Chhatarpur | Nagda | 05-Jun-23 |
| 15 | Bijawar | Tipari | 06-Jun-23 |
| 16 | Chhatarpur | Surai | 07-Jun-23 |
| 17 | Chhatarpur | Bhayora | 09-Jun-23 |
| 18 | Chhatarpur | Bhagwa | 11-Jun-23 |
| 19 | Chhatarpur | Hardoul Patti | 11-Jun-23 |
| 20 | Chhatarpur | Manikhera | 13-Jun-23 |
| 21 | Chhatarpur | Purapatti | 13-Jun-23 |
| 22 | Chhatarpur | Rampura | 16-Jun-23 |
| 23 | Chhatarpur | Chhaiguwan/Bhanguwah | 18-Jun-23 |
| 24 | Chhatarpur | Kachori | 18-Jun-23 |
| 25 | Bijawar | Jhargua | 20-Jun-23 |
| 26 | Bijawar | Pipariya Khurd | 22-Jun-23 |
| 27 | Panna | Bori | 24-Jun-23 |
| 28 | Damoh | Badagaon | 25-Jun-23 |
| 29 | Damoh | Hardua | 27-Jun-23 |
| 30 | Hatta | Achalpura | 28-Jun-23 |
| 31 | Damoh | Jangupura | 30-Jun-23 |

| | | | |
|---|---|---|---|
| 32 | Chhatarpur | Surajpura | 30-Jun-23 |
| 33 | Damoh | Bharatipura | 01-Jul-23 |
| 34 | Damoh | Daha | 03-Jul-23 |
| 35 | Damoh | Singhpur | 03-Jul-23 |