PROJECT TO AFFOREST AND PRESERVE DEGRADED AND FALLOW INDIGENOUSLY OWNED LANDS IN WEST BENGAL, INDIA

Project title	PROJECT TO AFFOREST AND PRESERVE DEGRADED AND FALLOW INDIGENOUSLY OWNED LANDS IN WEST BENGAL, INDIA
Project ID	5533
Crediting period	15-July-2022 to 14-July-2042
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Version	1.0
VCS Standard Version	4.7
Prepared by	Emergent Ventures India Pvt. Ltd.

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

The proposed project aims to restore degraded and fallow land by promoting sustainable plantation practices in West Bengal, India. The initiative involves planting timber and fruit-yielding species on lands owned by individual farmers, integrating climate-resilient strategies. The participating farmers are indigenous landholders that have adhered to traditional agricultural methods for generations.

Before the project, the baseline scenario consisted of land which is degraded overtime due to climate change and frequent drought events[1]. Under the project, the farmers are undertaking native and locally adapted species i.e. *Tectona grandis* (teak), *Acacia auriculiformis* (earleaf Acacia), *Mangifera indica* (mango), *Bombax ceiba* (simal), *Dalbergia sissoo* (seesham), *Millettia pinnata* (karanj), *Azadirachta indica* (neem) and *Citrus limon* (lemon). These species exhibit characteristic resistance to thrive in difficult environmental conditions. Without the project, the land would remain degraded and fallow.

Project activity instance 1 (PAI 1) spans Manbazar 1, Manbazar 2, Arsha and Bundwan blocks in Purulia district, West Bengal, India. PAI 1 is expected to achieve total GHG reductions or removals of 5,35,052 tCO_2e over the initial 20-year crediting period. The annual average carbon removal is estimated at 26,752tCO_2e.

Native and locally adapted trees are planted to enhance carbon sequestration, conserve biodiversity, improving ecosystem services and soil health along with empowering communities and boosting farmers' income. This effort aligns with multiple Sustainable Development Goals (SDGs) and national commitments to sustainability and climate change mitigation. This is a group project and up to two million plantations will be undertaken as additional areas are incorporated into the project over time.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation/ verification	15-July-2022--14-July-2042	VCS	Carbon Check (India) Pvt. Ltd.	20

1.3 Sectoral Scope and Project Type

[1] http://dx.doi.org/10.12944/CWE.18.2.10

Sectoral scope	14. Agriculture, Forestry and Other Land Use (AFOLU)
AFOLU project category[2]	Afforestation, Reforestation and Revegetation (ARR)
Project activity type	Afforestation

1.4 Project Eligibility

1.4.1 General eligibility

The project activities remove CO_2 which is among the seven Kyoto Protocol greenhouse gases and it is supported by methodology i.e. VM0047 'Methodology for Afforestation, Reforestation, and Revegetation' v1.1 approved under the VCS Program through the methodology development and review process.

The project complies with all rules and requirements stated in the following documents:

- VCS Standard, v4.7[3]
- VCS Program guide v4.4[4]
- VCS Methodology Requirements, v4.4[5]

It does not fall under any of the exclusions in Table 1 of the VCS Standard.

1.4.2 AFOLU project eligibility

The project activity falls under sectorial scope 14. The project aims to increase carbon sequestration by increasing the green cover in project area through planting trees. The justification of eligibility of the project under the scope of the VCS Program is given in the table below

Table 1: Eligibility conditions for Afforestation, Reforestation and Revegetation (ARR) and description under VCS (According to Appendix 1, Section A1.1 of VCS Standard v4.7).

Eligibility condition	Justification/Description
Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing,	The project activity involves plantation of trees on non-forest land, which will increase the carbon sequestration of the lands much higher

[2] See Appendix 1 of the VCS Standard

[3] https://verra.org/wp-content/uploads/2024/04/VCS-Standard-v4.7-FINAL-4.15.24.pdf

[4] https://verra.org/wp-content/uploads/2023/08/VCS-Program-Guide-v4.4.pdf

[5] https://verra.org/wp-content/uploads/2023/08/VCS-Methodology-Requirements-v4.4-updated-4-Oct-2023.pdf

increasing or restoring vegetative cover (forest or nonforest) through the planting, sowing or human-assisted natural regeneration of woody vegetation	than in the baseline conditions. Apart from that project will also reduce the soil erosion and therefore will increase soil organic carbon sequestration.
Eligible ARR projects may include timber harvesting in their management plan.	Timber harvesting is not included as part of the project activities within project crediting period. However, after 20 years, selective pruning of Earleaf Acacia (limited to an average of not more than 5% annually) and after 30 years selective pruning of teak (limited to an average of not more than 2% annually) may be permitted. Over any five-year period afterwards, total biomass removal from Acacia pruning and teak harvesting shall not result in a reduction of more than 20% in the project's cumulative carbon stocks.
The project area shall not be cleared of native ecosystems within the 10 year period prior to the project start date, as set out in Section 3.2.4.	The project activity did not clear the native ecosystems within the 10 year period prior to the project start date. Instead it will plant only those trees which are suitable and adapted to the native ecosystems of the project area.

1.4.3 Transfer project eligibility

Not Applicable.

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

This project has been designed as a grouped project, to allow the addition of new project activity instances after validation. The project is expected to expand up to two million plantations as additional areas are incorporated into the project over time. Upon inclusion, all new project instances must meet the following eligibility criteria:

New project activity instance eligibility criteria

SN	Eligibility conditions
1	The new PAIs will be within the geographical boundary of India.
2	The new PAIs will meet the applicability conditions (section 4) of the applied VCS methodology VM0047, V1.1.
3	In a new PAI, the technologies or measures used will be typical to the Afforestation, Reforestation and Revegetation (ARR) project involving planting of trees.
4	The new PAIs will have common baseline scenario conditions (as referred in the section 6 of the applied VM0047 methodology) with the initial instances.
5	The new PAI will have the same characteristics with respect to additionality with the initial instances.
6	In respect of each PAI, there will be evidence of project ownership held by the project proponent from the respective start date of each PAI.
7	The new PAI will have a start date same as or later than the grouped project start date.
8	The new PAIs will have crediting from start date of the instance through the end of the project crediting period (only).
9	The new PAIs will not be or have been enrolled in another VCS project

1.6 Project Proponent

Organization name	Hexa Carbon One Private Limited
Contact person	Rachit Verma
Title	Senior Vice President
Address	8th Floor, Tower 2, Vatika Business Park, Sector 49, Sohna Road, Gurgaon
Telephone	+91 91676 92971
Email	rachit.verma@hexaclimate.com

Organization name	Asvata Climate Solutions Private Limited
Contact person	Navin Mathur
Title	Chief operating officer
Address	Dr Annie Besant Rd, near Old Passport Office, Hanuman Nagar, Worli, Mumbai, Maharashtra 400030, India
Telephone	+91 98670 15373

Email	navin.mathur@asvata.com

1.7 Other Entities Involved in the Project

Organization name	IMPCA Services Pvt. Ltd.
Role in the project	Implementation Partner (IP)
Contact person	Dr Bikrant Tiwary
Title	Director
Address	Flat No.502, Tulsi Meadows, St. Anthony, Road, Near Uttam Society, Chembur, Mumbai, Mumbai City, Maharashtra, India- 400071
Telephone	+91 81088 77699
Email	bt@impca.in

1.8 Ownership

The project plantations have been established on privately owned land, with legal titles held by the individual farmers. Hexa Carbon One Private Limited and Asvata Climate Solutions Private Limited are the project proponents (PPs). PPs conducted a cross-verification of land titles by an independent entity. PPs assume responsibility for administrative duties, including the establishment of a monitoring system and the coordination of audits and will arrange necessary agreements with the farmers. IMPCA Services Pvt. Ltd. shall operate as the project implementation partner.

1.9 Project Start Date

Project start date	15-July-2022
Justification	Date of start of plantation

1.10 Project Crediting Period

Crediting period	☐ Seven years, twice renewable ☐ Ten years, fixed ☒ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)

Start and end date of first or fixed crediting period	15-July-2022 to 14-July-2042 (renewable as per VCS Standard v4.7, para 3.9.3)

1.11 Project Scale and Estimated GHG Emission Reductions or Removals

☒ < 300,000 tCO2e/year (project)

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

Calendar year of crediting period	Estimated GHG emission reductions or removals (tCO_2e)
15-July-2022 to 31-Dec-2022	7281
01-Jan-2023 to 31-Dec-2023	20,586
01-Jan-2024 to 31-Dec-2024	21,234
01-Jan-2025 to 31-Dec-2025	27,769
01-Jan-2026 to 31-Dec-2026	27,769
01-Jan-2027 to 31-Dec-2027	27,769
01-Jan-2028 to 31-Dec-2028	27,769
01-Jan-2029 to 31-Dec-2029	27,769
01-Jan-2030 to 31-Dec-2030	27,769
01-Jan-2031 to 31-Dec-2031	27,769
01-Jan-2032 to 31-Dec-2032	27,769
01-Jan-2033 to 31-Dec-2033	27,769
01-Jan-2034 to 31-Dec-2034	27,769
01-Jan-2035 to 31-Dec-2035	27,769
01-Jan-2036 to 31-Dec-2036	27,769
01-Jan-2037 to 31- Dec-2037	27,769
01-Jan-2038 to 31- Dec-2038	27,769
01-Jan-2039 to 31-Dec-2039	27,769

01-Jan-2040 to 31-Dec-2040	27,769
01-Jan-2041 to 31-Dec-2041	27,769
01-Jan-2042 to 14-July-2042	13,884
Total estimated ERRs during the first or fixed crediting period	5,35,052
Total number of years	20
Average annual ERRs	26,752

1.12 Description of the Project Activity

The PAI 1 aims to restore degraded land by promoting sustainable plantation practices in Purulia district, West Bengal, India. The initiative involves planting timber and fruit-yielding species in lands owned by individual farmers, integrating climate-resilient strategies. Native and locally adapted trees were planted to enhance carbon sequestration, empower communities, boost income, conserve biodiversity, and improve ecosystem services and soil health. This effort aligns with multiple Sustainable Development Goals (SDGs) and national commitments to sustainability and climate change mitigation.

Prior to the plantation activities, the project began with awareness-building sessions involving local villagers and Gram Panchayats, farmers, and local community members and consulted on key technical aspects, like water management, weed control, optimization of tree survival and growth rates. Among the farmers, representative caretaker was appointed for the project site monitoring and maintenance by the implementing partner. Additionally, the long-term economic and ecological benefits of tree plantation, particularly its role in carbon sequestration and land restoration, were emphasized.

Farmers were encouraged to formalize their participation through an onboarding and FPIC process, enabling them to benefit from carbon finance mechanisms while promoting sustainable land-use practices. Subsequently, carbon-offset agreements were signed between the farmers and PP.

The following steps were carried out in the project:

1. Preliminary feasibility survey and site selection

Lands in the project district were identified for the afforestation activity through

- Sites are selected based on ecological suitability, soil quality, water availability and nearby to community settlements.
- Priority is given to degraded, deforested, or barren lands with high restoration potential.

- Initial planning and site visit by a team of experts performing the historical land records and LULC analysis for the preliminary site assessment
- Final site selection occurs only after land eligibility verification and formal approvals, including on-ground assessment of landowners and farmer participation.

2. Planning and implementation

- Signing of consent and carbon waiver forms to onboard farmers, take their consent to participate and in-turn transfer the rights to generate and monetize carbon credits.
- List out the plant species according to the site suitability and farmers preference.

3. Collection of seedlings:

Saplings were raised in a well-maintained nursery using high-quality seeds, organic compost mixtures, and grow bags or poly pots. To ensure plant strength, all saplings underwent a hardening process. Only healthy saplings with robust root and shoot development were selected for field plantation.

4. Plantation Model, Planting design:

Block plantations were carried out across the project areas, with a typical spacing of 6 ft × 6 ft for timber species and wider spacing for fruit-bearing species.

5. Ground preparation activities (e.g. Soil working/tillage, soil/moisture conservation structures, fencing):

The project did not include any site clearance activities. This approach was adopted to preserve soil structure and reduce erosion. Based on site-specific conditions, soil and moisture conservation measures such as contouring and trenching around the plantation sites were implemented where necessary. Stones, boulders, and other debris were removed to facilitate successful tree establishment. Manual labour from local communities was prioritized over the use of machinery. This not only reduced the project's carbon footprint but also provided livelihood opportunities for local farmers during the preparatory phase.

Tree planting was carried out using the pit-planting method with optimally sized pits to support root growth and seedling survival. Teak was propagated from one-year-old root-shoots and kept in the nursery for another six months, while other species were grown from seeds and maintained for six months. Most saplings were around 20 cm tall at the time of planting. To protect young plantations from browsing and grazing, physical barriers such as trenching were established. Trenches also help in storing moisture, reducing the need of manual irrigation. Furthermore, social fencing involving local communities in care and monitoring of plantations was promoted to ensure long-term protection and sustainability of the plantation ecosystem.

Pit planting process without clearing existing vegetation

6. Planting of sapling

Healthy saplings from nurseries were used for planting in the fields. Natural and organic compost was applied to each pit during plantation to improve soil health and nutrient content. No chemical fertilizers were used. All plantations are strategically timed during the monsoon season to maximize natural water availability. This reduces dependence on irrigation and significantly enhances sapling establishment and survival rates.

7. Plantation management activities

- Weeding – Harmful weeds were removed manually.
- Patching – damaged seedlings to be replanted by fresh healthier ones

IP has conducted targeted training programs to participating farmers on effective plantation techniques and maintenance practices. As part of the implementation strategy, local caretakers have been appointed from among the participating landowners, creating employment opportunities while fostering community ownership and long-term stewardship of the plantation sites. Farmers bring valuable traditional knowledge on plant growth and ecosystem management, which is complemented by capacity-building initiatives introduced under the project.

8. Plantation risk mitigation measures

The major risks identified for the plantation in the current project area include forest fire, drought, and encroachment by wild and domestic animals. To address these challenges, the IP has adopted the following mitigation strategies:

Fire and Animal Encroachment Prevention:

To minimize the risks posed by fire and both wild and domestic animal intrusions, a trench-based barrier system has been implemented along the project boundary. Trenches measuring 5–6 feet in depth were excavated. This physical barrier serves as an effective deterrent, isolating the plantation area and reducing the likelihood of fire spread and animal entry.

Boundary trench as a firebreak and animal encroachment barrier

Drought Management:

Trenches help in drought management. Watering (using tanks from the nursery) is carried out only when necessary, typically during prolonged dry spells, using water transported from nearby nurseries. Implementing partner has deployed two mobile water tanks, each with a capacity of 2,000 liters. This low-intervention model supports ecological restoration by allowing saplings to adapt and thrive in natural conditions.

Mobile irrigation unit for drought mitigation

9. Sustainable Livelihoods and Community Empowerment:

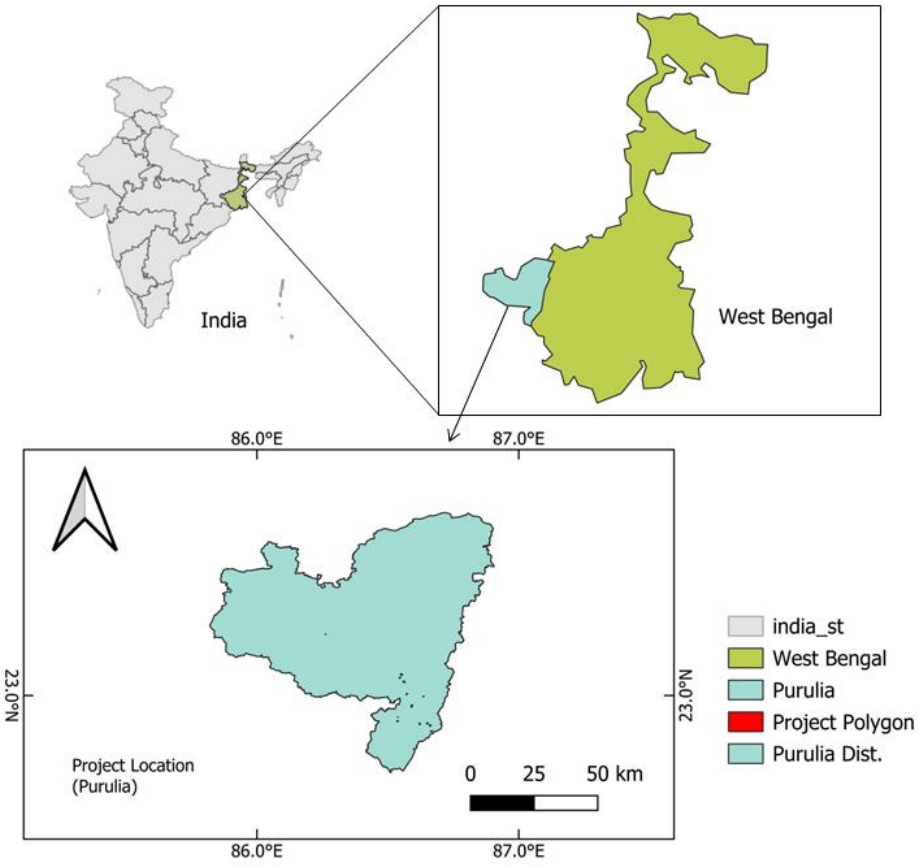
The project promotes livelihood enhancement through training in sustainable farming, composting and forest-based income activities. Beekeeping, including sustainable hive management and honey harvesting, is also an income-generating activity for which

communities are trained. Plans to scale include cooperative processing units and broader market access. These initiatives build local capacity while ensuring ecological balance and economic inclusion, especially for women, marginal workers, and tribal communities.

Additional Income generation through beekeeping, nursery management

1.13 Project Location

The PAI 1 is situated in Purulia district under West Bengal, India, which is bounded on the north by Paschim Barddhaman and Dhanbad (Jharkhand) districts, on the east by Bankura, on the south by Paschim Midnapur and Singbhum (Jharkhand) districts and in the west by Ranchi and Hazaribagh (Jharkhand) districts, spanning 6259 sq. km. It is bounded by the North Latitudes 22°43’ and 23°42’ & East Longitudes of 85°49’ & 86°49’. The nearest railway station to reach the project location is Purulia Junction Railway Station.



Project site location

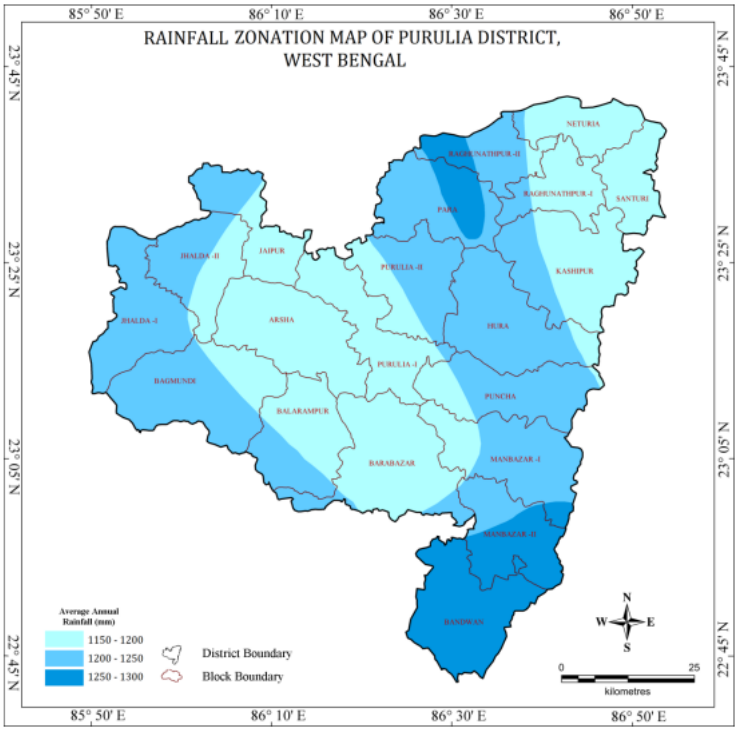
1.14 Conditions Prior to Project Initiation

Ecosystem type: The condition of the majority of the project lands, prior to the project initiation, was degraded and/or fallow land with lower soil productivity. The lands have not been covered by forest for at least 10 years prior to the start date of the project instance. They were uncultivated prior to the project activity and the ecosystem type falls in the category of arid to semiarid shrub land ecosystems.

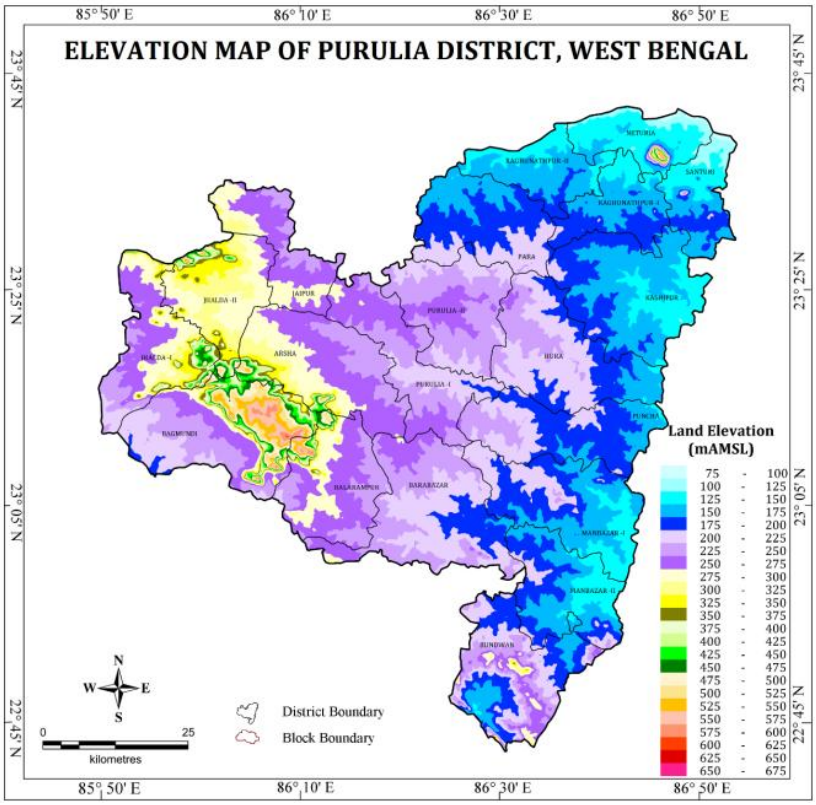
Current and historical land-use: The project area is currently undergoing the plantation. Prior to project initiation, the land was degraded due to climate change and frequent drought events.

Present and prior environmental conditions of the project area: The environmental conditions are as follows:

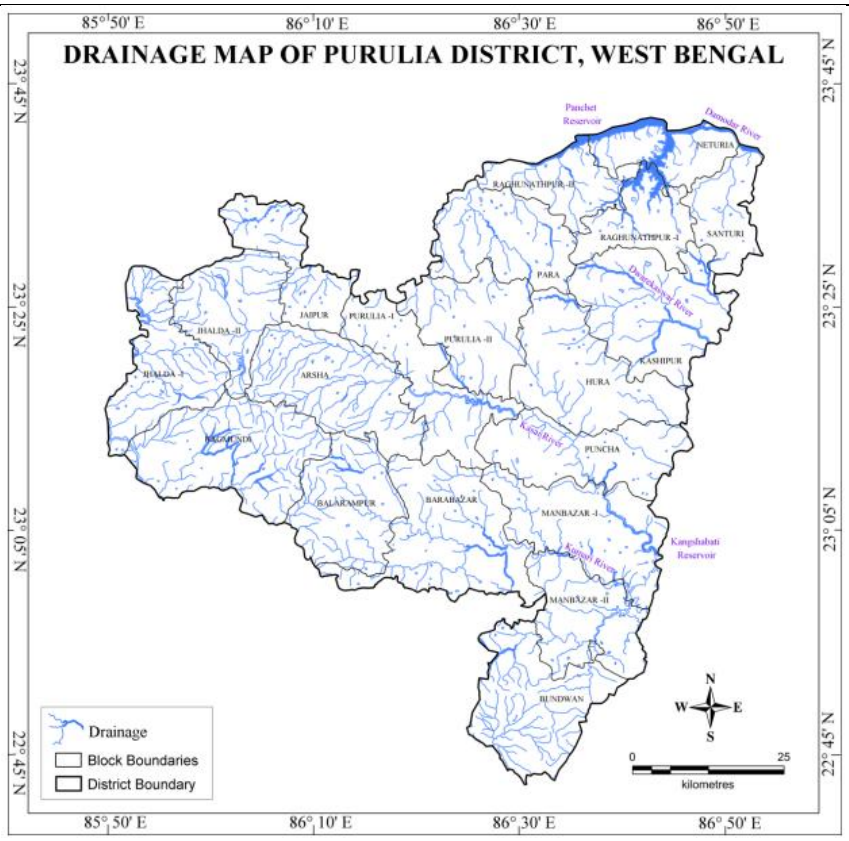
Conditions	Purulia District
Climate	Purulia experiences a subtropical climate characterized by high evaporation and low precipitation, making it one of the drought-prone districts of West

	Bengal. Summers (March–June) are extremely hot, with daytime temperatures often exceeding 40°C, while winters (November–February) are relatively mild. The district receives an average annual rainfall of 1100–1500 mm, with approximately 80% of the precipitation occurring during the South-West monsoon. Droughts are frequent, with moderate droughts occurring every three years and severe droughts every ten years. These climatic conditions highlight the need for effective water conservation and climate-adaptive land-use strategies to support sustainable plantation and agriculture[6].  Rainfall distribution map of Purulia District
Topography	Purulia district, situated on the eastern slopes of the Chotanagpur Plateau, features a hilly terrain with elevations ranging from 63 m to 712 m above sea level. The general land surface elevation varies between 150 m and 300 m, with a master slope directed toward the east and southeast. The project area falls under the category of low to highly dissected structural hills, functioning as key runoff zones for surrounding hills and pediments, influencing local hydrology and land-use patterns[6].

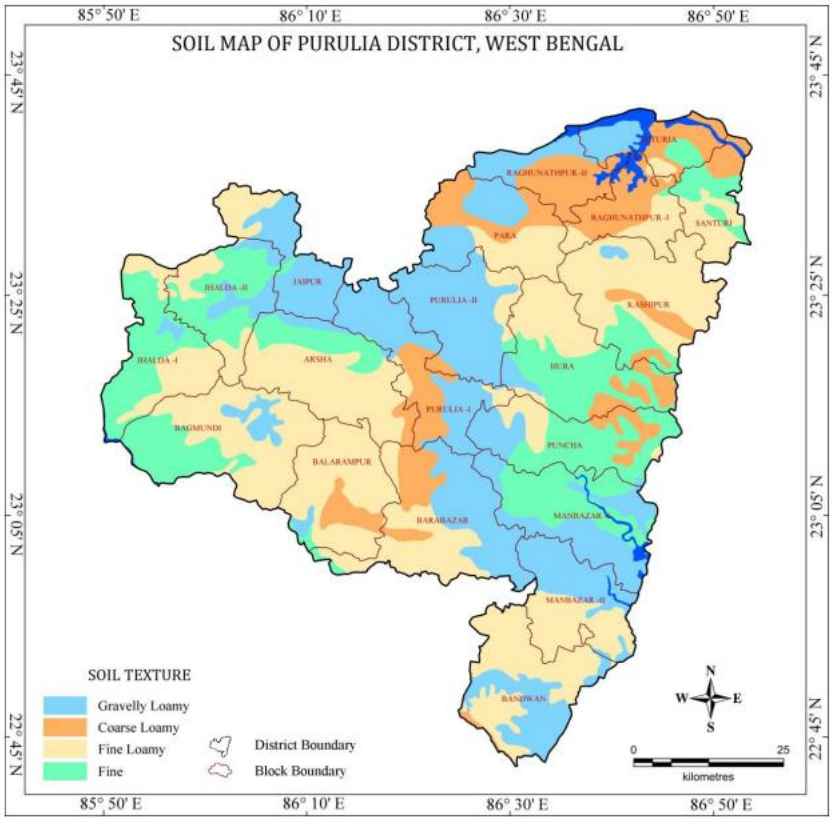
[6] https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/WEST-BENGAL/Purulia%20Final%20West%20Bengal.pdf

	 Land elevation map of Purulia District[7]
Hydrology	The Kasai River, flowing through the central part of Purulia, is the most significant river in the district, joined by its major tributary, Kumari, in the south. Other key perennial rivers include the Damodar and Subarnarekha, which contribute to the district's drainage network. The Darakeswar and Silai (Sialabati) rivers drain smaller areas in the northeastern and eastern parts of the district, respectively. Most streams in the region flow in an easterly or southeasterly direction, forming either a dendritic or radial drainage pattern. Additionally, the district has several ephemeral streams, including Sahara, Jorh, Bandhu, Nangsai, and Vanumata, which contribute to seasonal water flow dynamics[7].

[7] https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/WEST-BENGAL/Purulia%20Final%20West%20Bengal.pdf

	 Hydrology and drainage map of Purulia District
Soil	Soils found in the district are in general of the residual type which is derived directly from the weathering of the Achaean granites, gneisses and schists. Lateritic soil prevails in the uplands whereas, in the valleys, reddish clay loam or white to reddish clay are common. Many textural classes are met with; such as sandy loam, reddish loam, white or reddish stiff clay etc. Because of the undulating nature of the topography, the soil cover is thin and the soil is generally gravelly. The soil in the entire district is found to be acidic in nature. The fertility is also low as the soils contain very little organic matter except in the valley fills and river alluvium[8]. For the project sites, majority of the soils are slightly acidic in nature (pH 6-6.5), non-saline (EC 0.04 dSm^{-1}), with low organic carbon status.

[8] https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/WEST-BENGAL/Purulia%20Final%20West%20Bengal.pdf

	 Soil map of Purulia District
Type of vegetation and Land use	The forests, managed under the Purulia Forest Division, fall within the Northern Tropical Dry Deciduous Forest category. Crop cultivation in the district is influenced by factors such as topography, soil type, slope, climate, irrigation availability, and traditional agricultural practices. Due to poor soil fertility and limited irrigation infrastructure, 40–50% of the cultivated land follows a mono-cropping system. The extent of double and triple cropping is minimal. Paddy is the predominant crop, with other cultivated crops including potato, wheat, pulses (dal, maskalai), mustard, and maize. Agriculture in the region is primarily rain-fed, with low fertilizer application, making productivity highly dependent on seasonal rainfall patterns[9].

1.15 Compliance with Laws, Statutes and Other Regulatory Frameworks

Indian laws and regulations neither mandate nor restrict tree plantation activities on different land types, allowing afforestation and reforestation initiatives to proceed without legal barriers. The current afforestation/reforestation group project aligns with all applicable legal frameworks, ensuring compliance with national statutes and regulations. While the Indian Forest Act (1927), Wildlife Protection Act, (1972), Forest (Conservation) Act (1980), Environment (Protection) Act, 1986, National Forest Policy, 1988, provide guidelines for forest and environmental governance, they do not impose legally binding restrictions on private or community-led plantation activities.

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 1.12 affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes ☒ No

1.18 Sustainable Development Contributions

Prioritize the nationally stated sustainable development (SD) contributions and addressing the Global Sustainable Development Goals (SDGs) that include:

SDG 1: No Poverty

The project activity contributes to long-term employment opportunities within the community, both through full-time roles and seasonal casual labor. The selected tree species offer horticultural and medicinal value, while the current project also supporting community empowerment through beekeeping, honey harvesting, and training in composting, handicrafts, and forest-based income activities. These sustainable livelihood opportunities not only generate economic benefits but also help reduce poverty in the project area.

SDG indicator: Number of jobs provided,

SDG 2: Zero Hunger

The project supports farmers by restoring degraded and barren lands through plantations of fruit-bearing species, enhancing land productivity. Farmers can expect fruit harvests that contribute to both household nutrition and income, thereby strengthening food security.

SDG indicator: Number of fruit bearing individuals planted.

SDG 5: Gender equality

The project empowers women by engaging them in seasonal labor, full-time roles, and sustainable livelihoods. Training in composting, forest-based incomes, and beekeeping, especially for women, was conducted at project sites by IP. These efforts aim to improve their

socio-economic status, foster financial independence, and encourage active community leadership.

SDG indicator: Number of jobs provided to the women participants

SDG 8: Decent work and Economic Growth

Local stakeholders will benefit from direct employment opportunities and livelihood enhancement measures under the project. The implementing partner actively involves women and youth in nursery development and offers seasonal employment during plantation drives. Training and workshops will also be conducted on sustainable farming practices, beekeeping, handicraft production, and forest-based livelihood techniques. The initiative aims to engage members of the farming community in diverse roles, promoting economic development and ensuring long-term livelihood sustainability.

SDG indicator: Number of jobs provided.

SDG 10: Reduced inequalities

The project primarily benefits Indigenous and Scheduled Tribe communities from poor socio-economic backgrounds by providing both short- and long-term income opportunities. It promotes social inclusion through sustainable livelihood training, workshops, and equitable employment—ensuring access for all, regardless of gender, race, or religion. Additionally, regular health camps and awareness sessions on nutrition and sanitation are conducted to enhance overall community well-being and reduce disparities.

SDG indicator: Percentage of project beneficiaries belonging to Indigenous communities, Scheduled Tribes, and women.

SDG 13: Climate Action

Trees serve as one of the largest carbon sinks, absorbing atmospheric carbon dioxide through biomass accumulation and soil organic carbon storage. They play a crucial role in climate change mitigation by sequestering carbon and enhancing ecosystem resilience. In addition to conserving existing forests, expanding forest plantations on suitable lands is essential for strengthening carbon sequestration efforts and mitigating the impacts of climate change.

SDG indicator: Tonnes of greenhouse gas emissions avoided or removed

SDG 15: Life on Land

The project contributes significantly to climate change mitigation by converting degraded lands into productive plantations, which enhances ecosystem services by providing food and habitat for birds and wildlife while promoting biodiversity conservation through the establishment of green cover.

SDG indicator: Area of plantation covered under the project (in hectares)

1.19 Additional Information Relevant to the Project

1.19.1 Leakage Management

The project was implemented on degraded and barren land, verified through historical land records obtained from the land inventory office, interviews with the Gram Pradhan (village head), and a 10-year satellite imagery analysis. Since no project plots fall under agricultural land use, leakage due to the risk of displacing pre-existing activities is zero.

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

1.19.2 Further Information

Not Applicable (N/A).

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	At the project's inception, the implementing partner conducted a series of community sensitization sessions to identify stakeholders and carry out the Free, Prior, and Informed Consent (FPIC) process. Degraded or barren lands were identified through historical land records and consultations with the Gram Pradhan. A landowner list was prepared, followed by community development programs to raise awareness about the proposed afforestation initiative and its benefits for carbon project development. These sessions, held at 10–15 day intervals, helped identify interested farmers, primary stakeholders, as the project would be implemented on their private lands. Land eligibility was verified using land registry documents. Simultaneously, local leaders and nearby communities, considered secondary stakeholders, were engaged through consultations and focus group discussions, ensuring their involvement in project activities such as capacity building and awareness campaigns.
Legal or customary	All lands included in the project activity comprise barren and degraded, owned by individual farmers. In accordance with the

tenure/access rights	agreements signed with the farmers, the project proponent holds the legal right to implement the project and to claim the greenhouse gas (GHG) emission removal credits generated from it. Customary rights to the land and associated resources remain with the respective farmers. There are no disputes or conflicts regarding land ownership or resource rights.
Stakeholder diversity and changes over time	The primary stakeholders, including farmers and members of local communities, are permanent residents of the project area. The primary stakeholders also belong to the indigenous community. The ongoing project activities contribute significantly to socio-economic development and create future employment opportunities. These efforts play a vital role in supporting local farming communities to sustain their livelihoods within the project region, thereby reducing the need for migration to other areas.
Expected changes in well-being	The project enhances stakeholder well-being by promoting economic development, capacity building, and environmental sustainability through afforestation on barren and fallow lands. Planting timber and fruit-bearing species restores degraded ecosystems while generating socio-economic benefits. Local employment has been created in pit digging, plantation, site maintenance, and nursery development. Seasonal plantation drives particularly benefit women and youth by providing short-term livelihood opportunities. The implementing partner also supports alternative incomes through training in sustainable agriculture, beekeeping, composting, harvesting, and workshops on handicrafts and forest-based livelihoods. Additional employment is generated through nursery management, planting, monitoring, and other operational activities. Beyond livelihoods, the project improves community health through regular medical camps and awareness sessions on nutrition and sanitation. Environmentally, it supports land restoration, groundwater recharge, soil stabilization, carbon sequestration, and biodiversity conservation.
Location of stakeholders	The stakeholders are based in villages under Manbazar 1, Manbazar 2, Arsha and Bundwan blocks in Purulia district, West Bengal, India.

Location of resources	Within the boundaries of Purulia district, West Bengal, India.

2.1.2 Stakeholder Consultation and Ongoing Communication

Date of stakeholder consultation	05-June-2025
Stakeholder engagement process	The project proponent established a well-defined and structured process for conducting stakeholder consultations. Invitations were issued 15 days in advance of the meeting, disseminated in the local language through printed materials, community posters and phone calls. These were shared with identified stakeholders, local administrative bodies, the Forest Department, and the Gram Panchayat office. The consultation meeting was purposefully scheduled for 5th June—World Environment Day—to align with the project's core objectives of afforestation and environmental conservation. Prior to the formal commencement of the session, project information leaflets in the local language were distributed to all attendees, including farmers, community members, project staff, and resource-dependent groups. To ensure inclusivity and effective communication, the entire consultation was conducted in the local language, enabling participants to fully comprehend the project scope, activities, and potential impacts on their livelihoods and environment. Ample time was allocated for open discussion, allowing stakeholders to raise concerns, seek clarifications, and provide feedback. The proceedings were documented through a detailed Minutes of Meeting (MoM). Additionally, participants were provided with feedback forms to capture their understanding and perspectives on the project. Attendance was formally recorded in a Stakeholder Registration-cum-Attendance Sheet, provided in

Stakeholder Consultation meeting

Consultation outcome	The stakeholder consultation process followed a structured approach to ensure informed and inclusive participation. Each meeting generally included the following components: • Introduction to the carbon project, including ongoing plantation

	activities and overall project objectives. •Overview of planned and implemented interventions such as afforestation efforts, carbon credit generation, and socio-economic support for local communities. •Explanation of carbon credit mechanisms, applicable standards, and updates on relevant regulatory and policy frameworks. •Discussion on potential risks, stakeholder rights, and the grievance redressal mechanism. •Assessment of the project's impact on community well-being, environmental sustainability, natural resources, and future livelihood opportunities. •Outline of the validation, monitoring, and verification process under the Verified Carbon Standard (VCS). •Open forum for stakeholder feedback on project implementation, applied technologies, and the grievance resolution process. The consultation sessions ensured unbiased dissemination of project-related information to all stakeholders, regardless of caste, religion, gender, or ethnicity. This inclusive approach aimed to eliminate barriers to participation and foster equitable engagement. Comprehensive documentation of each meeting-including minutes, photographs, invitation letters, pamphlets, banners, and stakeholder feedback is systematically maintained by the project proponent.
Ongoing communication	During the local stakeholder meetings, participants were provided with the contact details—including the name, email address, and phone number—of the designated field coordinator appointed by the project proponent. This facilitated clear and accessible communication channels for stakeholders to raise inquiries or express concerns regarding the project. As a local resident, the coordinator possesses a strong understanding of the community's cultural and socio-economic context, enabling more effective engagement and timely resolution of grievances. Feedback and field-level issues are systematically gathered by middle management (project supervisor and project in-charge), who track and compile reports based on inputs from the field coordinator and other on-ground team members. These insights inform top management, who set strategic actions and

	communicate relevant decisions back to the stakeholders, ensuring a responsive and adaptive project implementation process.
Stakeholder input	During the stakeholder consultation meetings, participants were encouraged to share their feedback on project management, technological interventions, and the grievance redressal mechanism, as well as offer any additional suggestions. While no changes to the overall project design were proposed, some farmers requested the expedited implementation of the next phase of plantation activities. This recommendation has been duly noted and will be considered for timely action by the project proponent.

2.1.3 Free Prior and Informed Consent

Obtaining consent	The project area primarily comprises fallow and degraded lands owned by local farmers. The project proponents adopted a formal Free, Prior, and Informed Consent (FPIC) process, which included individual consultations, multiple village meetings, and project sensitization sessions. These engagements helped the stakeholders understand the project's objectives, intended socio-economic and environmental benefits, and clarified issues related to land tenure and carbon credit rights. Agreements were established with the participating landowners to facilitate plantation activities aimed at carbon sequestration. These agreements were secured through inclusive stakeholder consultations. While the landowners retain full customary rights over their land and natural resources, the rights to greenhouse gas (GHG) emission reductions or carbon credits generated through the project are held by the project proponent/representatives. At present, there are no reported disputes or conflicts concerning land ownership, resource access, or carbon credit entitlements.
Outcome of FPIC	The FPIC process resulted in transparent agreements signed by landowners, implementing partners, and the project proponent. These agreements authorize the project proponent to implement activities on barren and degraded lands owned by farmers and grant the legal rights to claim the resulting GHG emission removals or carbon credits. This ensures all parties are fully informed and in agreement with the terms of participation. The implementing partner confirms that

	the project has not encroached on any land or relocated individuals without consent. No one has been physically or economically displaced. As noted, areas with disputed or unclear ownership are excluded from the project. 

2.1.4 Grievance Redress Procedure

Development process	The implementing partner has established a platform for stakeholders to share grievances or suggestions. Each landowner can directly communicate with the assigned caretakers via phone or text message. Caretakers are required to visit the project lands on a daily basis. Additionally, all stakeholders are provided with the contact number of the field coordinator, which is included in the project description form. This grievance redressal process is explained to the community during meetings. Upon receiving a complaint, the implementing partner promptly reviews the issue and takes appropriate action. Moreover, the field coordinator regularly visits farmers' lands to collect feedback and address concerns. Farmers can also directly report any grievances during these visits.
Grievance redress procedure	The implementing partner follows a structured grievance redress mechanism to effectively manage and resolve complaints at various levels. Farm Level: At the village level, a total of nine caretakers, selected from among the participating farmers, are appointed to monitor and report grievances, challenges, and risks related to plantation activities on individual landholdings. Each caretaker provides daily updates to the field coordinator. The field coordinator, along with

	two field officers, conducts weekly visits to all project sites to address minor issues raised by stakeholders. Major grievances are documented and escalated as necessary. Operational Level: Field managers and coordinators review complaints received from the farm level. They assess the situation, implement short-term resolutions where possible, and escalate issues related to project management or technical aspects to higher authorities if required. Strategic Level: Complaints requiring long-term decisions or those that impact the overall success of the project are escalated to the Director Board and CEO. This top-level management is responsible for strategic decision-making, stakeholder communication, and assigning responsibilities to ensure timely and effective resolution.

2.1.5 Public Comments

The section shall be updated after the public comment period is over.

Comments received	Actions taken

2.2 Risks to Stakeholders and the Environment

2.2.1 Management Experience

2.2.2 Risk Assessment

	Risks identified	Mitigation or preventative measure(s) taken
Natural and human-induced risks to stakeholders' wellbeing	No risk	All selected species are native or naturalized (see Section 2.4.2) and pose no risk to stakeholder well-being. As the project generates no waste and uses no inorganic pesticides or fertilizers, there are no human-induced risks
Risks to stakeholder participation	No risk	The project follows a FPIC process, obtaining concession agreements (consent letters) from landowners for carbon finance

		activities. The project team has fully informed stakeholders about the project's benefits, costs, risks, rights, laws, and employment opportunities. Participation is voluntary, ensuring no risk to stakeholder involvement.
Working conditions	No risk	The project has implemented comprehensive measures to ensure safe and healthy working conditions for all workers.
Safety of women and girls	No risk	The project adopts a participatory approach that minimizes safety risks to women and girls. A monitoring units are established to oversee safety concerns and, when necessary, enforce legal protections.
Safety of minority and marginalized groups, including children	No risk	Article 29[9] of the Constitution guarantees the safety of minority and marginalized groups, including children, across all territories. Organization ensures a safe working environment for all project participants.
Pollutants (air, noise, discharges to water, generation of waste, and release of hazardous materials and chemical pesticides and fertilizers)	No risk	The project involves tree plantation and does not generate waste or pollutants. A safe disposal plan is in place for plastic bags used for saplings. Chemical pesticides and fertilizers are not used, aligning with India's nationwide ban on harmful fertilizers.[10]

2.3 Respect for Human Rights and Equity

[9] https://www.indiacode.nic.in/bitstream/123456789/19151/1/constitution_of_india.pdf

[10] Fertilizer legislation

2.3.1 Labor and Work

	Risks identified[11]	Mitigation or preventative measure(s) taken
Discrimination	No risk	The project is committed to fostering a safe and inclusive environment for all participants, with strict policies in place to prevent discrimination at any stage of implementation.
Sexual harassment	No risk	As per Section 354A.[12], sexual harassment is a punishable offense. The project proponent ensures zero tolerance for sexual harassment at all stages of project implementation.
Equal pay for equal work	No risk	In India, the principle of equal pay for equal work is upheld under laws such as the Equal Remuneration Act, 1976[13]. The project proponent fully complies with this by ensuring that men and women receive equal pay for the same or similar work.
Gender equity in labor and work	No risk	The project is committed to gender equity and equal opportunity for all participants. It ensures the active and meaningful participation of women and guarantees fair, unbiased compensation. Policies are in place to promote a diverse, inclusive workforce where all individuals are treated with respect and have equal access to

[11] 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.

[12] India Code: Section Details

[13] Microsoft Word - Equal Remuneration Act, 1976.doc

		opportunities, regardless of gender.
Forced labor	No risk	Farmers have voluntarily agreed to participate in the plantation project on their fallow lands, aiming to generate income through collective effort. Participation is entirely optional, allowing each farmer to decide based on personal preference. The project fosters collaboration, enabling farmers to leverage their land and skills for shared benefit.
Child labor	No risk	The project proponent strictly prohibits the use of child labor at any stage of the project, in compliance with national laws, recognizing it as a criminal and punishable offense.[14]
Human trafficking	No risk	The project strictly prohibits the employment of individuals subjected to human trafficking, recognizing it as a criminal and punishable offense under the law.[15]

2.3.2 Human Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk	The organization aligns its practices with national, regional, and international human rights standards. Customary land and resource rights are upheld by the respective farmers. The project fully respects the rights of local communities and customary rights holders in accordance with applicable human rights law.

[14] the child and adolescent labour (prohibition and regulation) act, 1986 no. 61 of 1986 date 23.12.1986.pdf

[15] Human Trafficking

2.3.3 Indigenous Peoples and Cultural Heritage

Risks identified	Mitigation(s) or preventative measure taken
No risk	The project safeguards cultural heritage by actively engaging local communities, ensuring a deep understanding of their social and environmental needs. It supports indigenous peoples and local communities through both long-term and short-term income-generating activities especially for women and youth, while training in sustainable agriculture, beekeeping, composting, handicrafts, and forest-based skills promotes alternative income sources.

2.3.4 Property Rights

Risks identified	Mitigation or preventative measure(s) taken
No risk identified	The project is implemented on private lands with legally documented ownership, duly verified by a legal consultant. Land and resource rights remain with local landowners and communities, while carbon rights are assigned to the project proponent through formal agreements. This ensures transparency and avoids any ambiguity regarding tenure or rights.

2.3.5 Benefit Sharing

Process used to design the benefit sharing plan	The benefit-sharing plan was developed through participatory consultations with individual farmers. These discussions ensured stakeholder understanding of carbon credit ownership, land and resource rights, benefits, and project roles. Feedback from participants directly informed the final benefit-sharing arrangements.
Summary of the benefit sharing plan	The agreement ensures that landholders retain full rights over their land and resources, while the project proponent retains ownership of the carbon credits. In return, communities receive comprehensive support for plantation activities (including seedlings, training, and tools) along with livelihood benefits such as income opportunities

	through full-time and seasonal employment, as well as engagement in beekeeping, composting, handicrafts, and other forest-based income-generating activities. These efforts also contribute to broader environmental restoration. Additionally, a financial value (to the extent of 10% of budgeted net revenue from the sale of carbon credits) has been taken into consideration for distribution to Land Owners. This will be primarily directed towards developing social infrastructure, capacity-building initiatives, and facilities that support long-term socio-economic improvement. The IP will remain the preferred channel for executing these investments and managing revenue distribution.
Approval and dissemination of benefit sharing plan	All agreements are signed by participating landowners and the project proponent, communicated in the local language and delivered in a culturally appropriate manner. Records are securely maintained and available for review upon request.

2.4 Ecosystem Health

	Risks identified	Mitigation or preventative measure(s) taken
Impacts on biodiversity and ecosystems	No risk	**Justification:** The tree species planted under the project activity comprise only native and locally adapted or naturalized species, ensuring no adverse impact on local biodiversity or ecosystem integrity.
Soil degradation and soil erosion	No risk	**Justification:** The current afforestation program is undertaken on degraded lands, aiming to enhance soil quality, ecological stability, nutrient cycling, and overall ecosystem functioning[16] and reduce soil erosion.
Water consumption and	No risk	**Justification:** Afforestation reduces

[16] https://doi.org/10.1002/9781119910527.ch8

stress		water loss through evaporation, while complex root systems enhance soil water retention, and water utilization from soil profiles, thereby alleviating water stress.[17]

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

Species and habitat	Not Applicable
Areas needed for habitat connectivity	Not Applicable

	Risks identified	Mitigation or preventative measure(s) taken
Habitats for rare, threatened, and endangered species	No risk	The project is neither located within nor adjacent to habitats of any rare, threatened, or endangered species, as none have been identified in the area.
Areas for habitat connectivity	No risk	The project is neither located within nor adjacent to habitats of any rare, threatened, or endangered species, as none have been identified in the area.

2.4.2 Introduction of Species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
Tectona grandis (Teak)	Native[18]	The selected species are indigenous to the region, thereby ensuring ecological compatibility and contributing	N/A

[17] https://doi.org/10.1007/s11676-014-0431-8

[18] https://apps.worldagroforestry.org/treedb/AFTPDFS/Tectona_grandis.PDF

		to the conservation of biodiversity.	
Acacia auriculiformis (Earleaf Acacia)	Non-native (naturalized)[19]	Introduced to India in the 1940s, this species has been instrumental in restoring degraded, drought-prone areas by improving soil moisture retention and nutrient levels. It also holds therapeutic, ornamental, and shade value.[20]	N/A
Mangifera indica (Mango)	Native[21]	The selected species are indigenous to the region, thereby ensuring ecological compatibility and contributing to the conservation of biodiversity along fruiting yield for economic Security of the communities.	N/A
Bombax ceiba (Simal)	Native[22]	The selected species are indigenous to the region, thereby ensuring ecological compatibility and contributing to the conservation of biodiversity.	N/A
Dalbergia sissoo (Seesham)	Native[23]	The selected species are indigenous to the region, thereby ensuring ecological compatibility and contributing to the conservation of biodiversity	N/A
Millettia pinnata (Karanj)	Native[24]	The selected species are indigenous to the region, thereby ensuring ecological compatibility and contributing to the conservation of biodiversity	N/A
Azadirachta indica (Neem)	Native[25]	The selected species is indigenous to the region, thereby ensuring ecological	N/A

[19] Kushalapa, K. A. (1991). Performance of Acacia auriculiformis in India.

[20] https://doi.org/10.1007/s11676-017-0497-1

[21] https://pmc.ncbi.nlm.nih.gov/articles/PMC3249901/

[22] https://indiabiodiversity.org/species/show/31106

[23] http://nbrienvis.nic.in/files/ENVIS_634868511844620235_Dalbergia.pdf

[24] https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.42835

[25] https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.8112

		compatibility and contributing to the conservation of biodiversity. A versatile tree widely recognized for its pesticidal and insecticidal properties, with additional traditional uses in medicine and cosmetics.	
Citrus limon (Lemon)	Native[26]	The selected species is indigenous to the region, thereby ensuring ecological compatibility and contributing to the conservation of biodiversity.	N/A

Existing invasive species	Mitigation measures to prevent the spread or continued existence of invasive species
Not Applicable	No invasive species have been detected in the project area; hence, no mitigation measures are currently in place. However, a proactive management plan was established at project initiation to address potential future occurrences and will be updated as necessary.

	Risks identified	Mitigation or preventative measure(s) taken
Invasive species	No risk	Not Applicable

2.4.3 Ecosystem Conversion

The project area has not undergone clearance of any natural ecosystems prior to implementation. The activity does not entail ecosystem conversion within or surrounding the site.

	Risks identified	Mitigation or preventative measure(s) taken
Ecosystem conversion	No risk	Not Applicable

3 APPLICATION OF METHODOLOGY

[26] https://www.darwin.nt.gov.au/sites/default/files/publications/attachments/lemon_0.pdf

3.1 Title and Reference of Methodology

The following methodologies and tools have been selected for the project activity:

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	VM0047	Afforestation, Reforestation, and Revegetation	v1.1
Module	VMD0054	Module for Estimating Leakage from ARR Activities	v1.0

3.2 Applicability of Methodology

The project applies the VCS methodology VM0047 v1.1, which is implemented for the Afforestation and Reforestation and Revegetation'. The project meets the applicability conditions of this methodology, and modules and tools which are justified in the table below:

Methodology ID	Applicability condition	Justification of compliance
VM0047	1. Project activities increase vegetative cover	The main purpose of this project is to significantly increase of carbon stocks through afforestation activities.
	2. Area based, census based, or a combination of the two quantification approaches may be used provided approach specific applicability conditions are met.	The project implements area based approach as Planting density exceeds 50 planting units per hectare.
	3. The project start date is documented as the earliest of the following: a) The date on which site preparation activities began; b) The land use change date	The project start date is defined by pit planting without clearing existing vegetation.
	4. Projects do not take place on organic soils or wetlands.	The project area does not fall under organic soils[27].

[27] https://data.apps.fao.org/glosis/?share=f-6756da2a-5c1d-4ac9-9b94-297d1f105e83&lang=en

		The lands do not fall in the wetland category according to the definition of Ramsar Convention 4[28] The inclusion of project activity instances has been screened by collection of geo coordinates (latitude and longitudes) of project activity instances and Using remote sensing imagery to identify any water body that fall in the project boundary.
	5. Area based requirement: Project activities involve direct planting activities (e.g., manual planting, broadcast seeding), indirect activities associated with assisted natural regeneration (e.g., liana cutting, weed management, or barriers that prevent animal grazing), or a combination of direct and indirect activities.	The project activity has covered the plantation of native tree species.
	6. Area based requirement: Project proponents establish a t = 0 carbon stock estimate for all significant carbon pools. The method for establishing t = 0 estimates depends on the activity that initiates the project start date. Where the project start date is defined by a land use change date or where the project start did not include site preparation that caused a significant decrease in carbon stocks in monitored carbon pools (e.g., pit	The project start date is defined by a land use change date as the project start did not include site preparation that caused a significant decrease in carbon stocks in monitored carbon pools (e.g., pit planting without clearing existing vegetation). Plot-based sampling will be followed to establish t = 0 carbon stock estimates for all significant carbon pools.

[28] https://www.ramsar.org/sites/default/files/documents/library/handbook1_5ed_introductiontoconvention_final_e.pdf

	planting without clearing existing vegetation) the following conditions must be met: i) The project proponent establishes t = 0 estimates within two years after the project start date. ii) Plot-based sampling occurs for all significant carbon pools. iii) Evidence is provided to demonstrate that site preparation did not involve clearing, burning, or mechanical disturbance of existing vegetation that would significantly reduce monitored carbon pools. Evidence may include, but is not limited to, georeferenced photos, field survey data, satellite imagery, and signed attestations from landowners.	
	7. Area based requirement: Leakage must be monitored and quantified using VMD0054.	Leakage has been accounted for all identified project land parcel, where displacement of pre-project agricultural activities (including grazing) and fuel wood collection activities would occur following VMD0054.
	8. The project must not occur on lands that have met the definition of managed forest at any point in the 10-year period immediately preceding the project start date.	The project area has not been classified as managed forest at any time during the 10 years prior to the project start date.
	9. The project must not have clearing of pre-existing woody biomass involves timber harvesting or results in degradation of native ecosystems.	No clearing of pre-existing woody biomass, timber harvesting or degradation of native ecosystems has occurred due to the project activity.
	10. The project is planting fewer than 50 planting units per hectare and	The project implements area based approach as planting density

	could use the census-based approach	exceeds 50 planting units per hectare.
VMD0054	Projects using this module must meet all applicability conditions of the methodology VM0047 Afforestation, Reforestation and Revegetation.	The project meets all the applicability conditions of applied methodology VM0047 v1.1 as stated above.

3.3 Project Boundary

Selected carbon pools in the baseline and project scenarios are:

Source	Included?	Justification/Explanation
Aboveground woody biomass	Yes	Major carbon pool
Aboveground non-woody biomass	Excluded	The project activity does not reduce carbon pool as per APPENDIX 2 of the applied methodology.
Belowground woody biomass	Yes	Major carbon pool
Belowground non-woody biomass	Excluded	The project activity does not reduce carbon pool as per APPENDIX 2 of the applied methodology.
Deadwood	Excluded	No significant increase has been observed as the activity locations are degraded, fallow or barren lands and do not have deadwood.
Litter	Excluded	No significant vegetation cover has been observed as the activity locations are barren and fallow lands, and do not have litter.
Soil organic carbon (SOC)	Excluded	The soil inversion has not been done at depth exceeding 25 cm and will not be done more than once.
Harvested wood products	Excluded	As no significant vegetation cover is present and harvesting of wood is not done within the project activity parcels. Thus, conservatively excluded.

GHG sources included in or excluded from the project boundary in the baseline and project scenarios are:

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of biomass (natural or anthropogenic causes)	CO_2	No	Conservatively excluded
		CH_4	No	Conservatively excluded
		N_2O	No	Conservatively excluded
	Emissions from nitrogen fertilizer	CO_2	No	Conservatively excluded
		CH_4	No	Conservatively excluded
		N_2O	No	Conservatively excluded
	Burning of fossil fuels	CO_2	No	Conservatively excluded
		CH_4	No	Conservatively excluded
		N_2O	No	Conservatively excluded
Project	Burning of biomass (natural or anthropogenic causes)	CO_2	No	Carbon stock decreases due to burning shall be accounted as a carbon stock change.
		CH_4	No	Accounted if found to be a significant source.
		N_2O	No	Accounted if found to be a significant source.
	Emissions from nitrogen fertilizer	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	Not applicable
	Burning of fossil fuels	CO_2	No	Not applicable
		CH_4	No	Not applicable
		N_2O	No	Not applicable

For spatial project boundary please refer to the section 1.13

3.4 Baseline Scenario

Prior to the project implementation, baseline scenario consisted of land which is degraded overtime due to climate change and frequent drought events.

Under the area-based approach, a dynamic performance benchmark (PB) is used to set the crediting baseline. This benchmark represents the business-as-usual changes in vegetation cover, calculated as the ratio of the average change in the stocking index (SI) of control plots to

project plots. The baseline will be established at every verification period using an updated performance benchmark. The assessment has been provided in APPENDIX 2.

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

3.5.2 Additionality Methods

The project applies a performance method for area-based approach for the demonstration of additionally.

Area-based approach:

For lands under area-based approach, following steps are followed to demonstrate additionality:

Performance benchmark

Please refer APPENDIX 2 for detailed steps for calculation of performance benchmark.

Investment analysis

The participating farmers are predominantly smallholders engaged in subsistence agriculture, with limited or no supplementary income. The drought-prone nature of the region further exacerbates their vulnerability. High upfront costs for establishing timber and fruit tree plantations are beyond their financial capacity. While short-term loans for seasonal grain and cash crops are relatively accessible, securing credit for tree cultivation is challenging due to its long payback period, making it a financially risky and unaffordable enterprises for these farmers.

The project, voluntarily initiated by the implementing partner, aims to establish diverse tree plantations on fallow lands. It has been entirely funded by the proponent's own resources, allocated based on a careful assessment of anticipated carbon revenues. Carbon finance serves as the only viable funding mechanism, with carbon credits as the sole source of project financing.

As a voluntary initiative by the proponent, the project relies solely on carbon finance, with no additional revenue streams beyond carbon credit sales.

3.6 Methodology Deviations

No methodology deviations are applied.

4 QUANTIFICATION OF ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Area-based approach

Carbon stock changes in the baseline scenario are accounted by multiplying the performance benchmark value to the project carbon dioxide removals. The performance benchmark, defined as the business-as-usual increase in vegetative stocking relative to the project, is set based on data from representative control plots outside of the project area. Step-wise details for derivation of dynamic performance benchmark are given in APPENDIX 2.

4.2 Project Emissions

4.2.1 Project Carbon Stock Changes

The project carbon stock change in year t is estimated as follows (Equation 1, Section 8.2.1):

$$\Delta C_{WP,t} = (\Delta C_{WP-biomass,t} \times \frac{44}{12})$$

Where:

$\Delta C_{WP,t}$	=	Project carbon stock change in year t (t CO2e)
$\Delta C_{WP\text{-}biomass,t}$	=	Change in carbon stock in biomass carbon pools in the project scenario through year t (t C)
44/12	=	Ratio of molecular weight of carbon dioxide to carbon (unitless)
t	=	1, 2, 3, …, t years elapsed since the project start date

Equation 2, Section 8.2.1:

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

Where:

$\Delta C_{WP\text{-}biomass,t}$	=	Change in carbon stock in biomass carbon pools in the project scenario through year t (t C)
$\Delta C_{WP\text{-}woody,t}$	=	Change in carbon stock in woody biomass in the project scenario through year t (t C)
t	=	1, 2, 3, …, t years elapsed since the project start date

4.2.2 Woody Biomass

Area-based quantification

The net carbon stock change in tree biomass in the project scenario is estimated as (equation 3, section 4.2.1.1):

$$\Delta C_{WP-woody,} = A \times (C_{WP-woody,t} - C_{WP-woody,t=0})$$

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

Equation 4, section 4.2.1.1

$$C_{WP\text{-}woody,} = C_{WP\text{-}woody\text{-}AB,} \times (1 + R)$$

Where:

$C_{WP\text{-}woody,t}$	=	Average carbon stock in woody biomass in the project scenario in year t (t C/ha)
$C_{WP\text{-}woody\text{-}AB,t}$	=	Average carbon stock in aboveground woody biomass in the project scenario in year t (t C/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

$C_{WP-woody,t=0}$ estimate of pre-existing biomass was done using plot-based sampling as the project start date is defined by a land use change date or where the project start did not include site preparation that caused a significant decrease in carbon stocks in monitored carbon pools (e.g., pit planting without clearing existing vegetation).

4.3 Leakage Emissions

Since no project plots fall under agricultural land use, leakage due to the risk of displacing pre-existing activities is zero.

4.4 Estimated GHG Emission Reductions and Carbon Dioxide Removals

Area-based quantification

As per the equation 32 of section 8.6.1 of the methodology:

$$CR_t = \left(MIN\left(\Delta C_{WP,t}, \Delta C_{WP,t} \times (1 - PB_t)\right) \times (1 - UNC_t)\right) - PE_t - LK_t - \left(\left(MIN\left(\Delta C_{WP,t-x}, \Delta C_{WP,t-x} \times (1 - PB_{t-x})\right) \times (1 - UNC_{t-x})\right) - PE_{t-x} - LK_{t-x}\right) \quad (32)$$

Where:

CR_t	=	Carbon dioxide removals from the project activity in the monitoring interval ending in year t (t CO_2e)
$\Delta C_{WP,t}$	=	Project carbon stock change through year t (t CO_2e)
PB_t	=	Performance benchmark for the monitoring interval ending in year t (%)
LK_t	=	Leakage through year t (t CO_2e)
PE_t	=	Project emissions from biomass burning and fertilizer use in year t (t CO_2e)
UNC_t	=	Uncertainty in cumulative removals through year t (%)

State the non-permanence risk rating (%)	18%
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).	Harvesting is not involved in the project.
Has the LTA been updated based on monitored data, if applicable?	☐ Yes ☒ No Harvesting is not involved in the project.
State, in tCO_2e, the expected total GHG benefit to date.	
Is the number of GHG credits issued below the LTA?	☐ Yes ☒ No Harvesting is not involved in the project.

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)
15-July-2022 to 31-Dec-2022	0	7,281	0	1,311	0	5,971	5,971
01-Jan-2023 to 31-Dec-2023	0	20,586	0	3,706	0	16,881	16,881
01-Jan-2024 to 31-Dec-2024	0	21,234	0	3,822	0	17,412	17,412
01-Jan-2025 to 31-Dec-2025	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2026 to 31-Dec-2026	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2027 to 31-Dec-2027	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2028 to 31-Dec-2028	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2029 to 31-Dec-2029	0	27,769	0	4,998	0	22,770	22,770

01-Jan-2030 to 31-Dec-2030	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2031 to 31-Dec-2031	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2032 to 31-Dec-2032	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2033 to 31-Dec-2033	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2034 to 31-Dec-2034	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2035 to 31-Dec-2035	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2036 to 31-Dec-2036	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2037 to 31-Dec-2037	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2038 to 31-Dec-	0	27,769	0	4,998	0	22,770	22,770

2038							
01-Jan-2039 to 31-Dec-2039	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2040 to 31-Dec-2040	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2041 to 31-Dec-2041	0	27,769	0	4,998	0	22,770	22,770
01-Jan-2042 to 14-July-2042	0	13,884	0	2,499	0	11,385	11,385
Total	0	535,052	0	96,309		438,743	438,743

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	A
Data unit	Ha
Description	Project area
Source of data	Calculated from GIS data
Value applied	219.8
Justification of choice of data or description of measurement methods and procedures applied	Delineation of the project area has been done by using a combination of GIS coverage, ground survey data and GPS.

Purpose of data	Calculation of project emissions using the area-based quantification approach
Comments	None

Data / Parameter	R
Data unit	dimensionless
Description	Root to shoot ratio indicating fraction of below-ground to above-ground dry biomass
Source of data	IPCC GPG LULUCF 2003 Table 3A.1.8
Value applied	0.27
Justification of choice of data or description of measurement methods and procedures applied	As per guidance of applied VCS methodology VM0047 Version 1.1
Purpose of data	Calculation of project emissions using the area-based quantification approaches
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-Volume 4 Agriculture, Forestry and Other Land Use, Forestry, Table 4.3, tropical/subtropical wood
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	IPCC is a reputable source approved under the VCS.
Purpose of data	Calculation of project emissions using the area-based approach.
Comments	None

Data / Parameter	Biomass expansion factor (BEF)
Data unit	N/A
Description	Converts trunk biomass to total above and belowground tree biomass.
Source of data	References are provided in ERR sheet.
Value applied:	Values are provided in ERR sheet.
Justification of choice of data or description of measurement methods and procedures applied	The values are taken from referenced sources and to be used in calculation as per guidance of applied VM0047; Version 1.1
Purpose of Data	To calculate GHG removals by a species.
Comments	None

Data / Parameter	wd
Data unit	t dry matter m^{-3}
Description	Basic wood density
Source of data	References are provided in ERR sheet.
Value applied:	Values are provided in ERR sheet.
Justification of choice of data or description of measurement methods and procedures applied	The values are taken from referenced sources and to be used in calculation as per guidance of applied VM0047; Version 1.1
Purpose of Data	To calculate GHG removals by a species.
Comments	None

5.2 Data and Parameters Monitored

Data / Parameter	DBH

Data unit	meter
Description	Tree diameter at breast height (at 1.37 m)
Source of data	Monitoring from sample plots in the field.
Description of measurement methods and procedures applied	Standard operating procedures (SOPs) are made in line with national forest inventory guide or published handbooks or IPCC GPG LULUCF 2003
Frequency of monitoring/recording	Every 5 years or more frequently
Value applied:	Ex-post data collection
Monitoring equipment	Measuring Tape
QA/QC procedures applied	Quality control/quality assurance (QA/QC) procedures prescribed under National Forest Inventory are applied. In absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 may be applied.
Purpose of data	Calculation of project emissions using the area-based quantification approach
Calculation method	The parameter is used as entry data into the tree growth equations for the calculation of biomass.
Comments	None

Data / Parameter	H
Data unit	meter
Description	Height of a tree
Source of data	Field measurements
Description of measurement methods and procedures to be applied	Standard operating procedures (SOPs) are made in line with national forest inventory guide or published handbooks or IPCC GPG LULUCF 2003

Frequency of monitoring/recording	Before every verification event
Value applied	Ex-post data collection
Monitoring equipment	Hypsometer
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under National Forest Inventory are applied. In absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 may be applied.
Purpose of data	Calculation of project emissions using the area-based quantification approach
Calculation method	The parameter is used as entry data into the growth equations for the calculation of tree biomass.
Comments	None

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 and procedures to be applied	Aboveground woody biomass must be measured via plot-based sampling
Frequency of monitoring/recording	Every five years or more frequently
Value applied	Ex-post measurement
Monitoring equipment	Derived through calculation using growth equations and its component monitoring parameters
QA/QC procedures to be applied	Quality control/quality assurance (QA/QC) procedures prescribed under National Forest Inventory are applied. In absence of these, QA/QC procedures from published handbooks or from IPCC GPG LULUCF 2003 may be applied.

Purpose of data	Calculation of project emissions using the area-based quantification approach
Calculation method	Calculated as the average of sample measurements
Comments	None

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	Delineation of the area burned will use a combination of remote imagery (satellite or aerial photographs) or ground survey data with GPS.
Frequency of monitoring/recording	Every five years or more frequently
Value applied	Ex-post data collection, if any
Monitoring equipment	Identify equipment used to monitor the data/parameter including type, accuracy class, and serial number of equipment, as appropriate.
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 using the area-based quantification approach
Calculation method	Calculated using GIS
Comments	NA

5.3 Monitoring Plan

Monitoring will be conducted as per VM0047 v1.1 and VCS Standard v4.7 procedures, ensuring accurate monitoring for evaluating project performance and verifying net anthropogenic GHG emission removals.

Organizational structure for project monitoring

The project adopts a structured and multi-tiered monitoring system to ensure transparency, accountability, and long-term impact:

•Caretaker Assignment & Monitoring: Each plantation block is assigned a dedicated caretaker, typically a trained local or landowner. One caretaker manages approximately 50,000 to 100,000 plants, responsible for regular site inspections, mortality tracking and replantation, fire prevention and reporting.

•Scheduled Field Visits: Field teams, including the field executive and field in-charge, conduct weekly and monthly site visits to assess plant growth, validate reports, and guide replantation efforts where necessary.

•Digital Recordkeeping: The implementing partner maintains GPS-tagged plantation records along with photographic evidence for verification and reporting. Caretakers are trained in tree species identification, measurement techniques (e.g., using tape), and data recording protocols.

•Community Feedback Mechanism: A channel is established for local communities to report observations or concerns directly to the project team, strengthening grassroots involvement.

Ground monitoring:

This monitoring plan outlines the data collection approach to: (a) verify compliance with applicability conditions (Section 3.2, Tables 2 & 3), (b) track changes in selected carbon pools, and (c) assess project and leakage emissions. Biomass estimation will follow allometric methods based on multiple unit measurements, focusing on key carbon pools—above-ground biomass (AGB) and below-ground biomass (BGB). The monitoring process will include the following steps:

1. Stratify the project area into relatively homogeneous units to enhance measurement precision. Stratification will be based on parameters from field partners, preliminary soil and field surveys, and agro-climatic zones. Ex-post stratification may be revised to reflect disturbances (e.g., hydrological changes, fire, pests, disease) or management interventions occurring during the crediting period.

2. The sampling framework-including sample size, plot size and shape, and plot distribution across strata-will be determined using the latest version of CDM Tool AR-TOOL03[29]. A confidence level of 90% or 95% will be maintained.

3. Stratified random sampling will be conducted at each site to establish permanent sampling plots. GPS will be used to record geo-coordinates, and a post-stratification map will be generated using GIS after the first monitoring to capture any boundary changes.

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

4. Fixed-area plots of 10 × 10 m will be established within plantations to record tree count, height, and diameter at breast height (DBH) at 1.37 m. Biomass will be estimated using growth equations provided in the ERR sheet. DBH will be measured with a tape at a standardized height of 1.37 m, marked on meter sticks to ensure consistency. Each tree will be individually recorded on field data sheets, with separate entries for each tree to capture all relevant parameters.

5. Field data will be recorded on paper sheets and transcribed to electronic format. Anomalies will be identified through database checks and verified or corrected as needed. A GIS-based electronic database will be developed and archived in both digital and hard copy formats, along with original field sheets. All project data will be retained for at least two years beyond the crediting period. Monitoring will occur within the first five years and annually thereafter.

6. Some project sites will also be monitored using LiDAR-based drone surveys and satellite remote sensing. While this data may not be directly used for carbon calculations, it can be correlated with on-ground monitoring to support and validate plantation growth. This approach provides a reliable means of supplementing growth assessments across the remaining project sites.

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

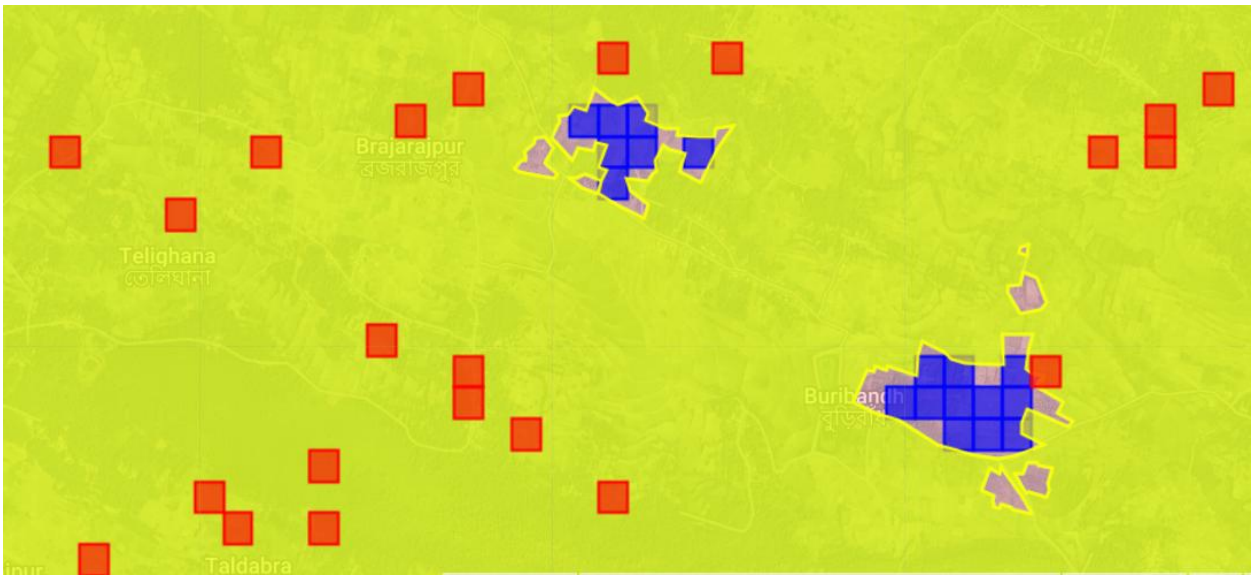
Not Applicable.

APPENDIX 2: ESTIMATION OF DYNAMIC PERFORMANCE BENCHMARK

Step 1: Selection of project plots

1) The entire project polygons eligible under area-based approach were divided into contiguous, non-overlapping units (project plots) of 0.36 hectares (60 m × 60 m) size. Only those plots which have at least 75 percent within the project area boundary were accounted.

2) A representative sample of n = > 30 project plots were selected via random sampling from all the possible project plots



Samples of project plots (Blue square) across the studied polygons

Step 2: Selection of control plots for each project plot

1) Selection of donor pool area

Donor pool area from which control plots is sourced is defined by applying the criteria in Table A1 of VM0047, v1.0 as follows:

Factor	Procedure and data source (GIS layer)
Jurisdictional boundary	The project area is not within a subnational jurisdiction either registered under Jurisdictional and Nested REDD+ (JNR) or delineated by the national or subnational government for reporting REDD+ (e.g.,

	delineated as a discrete Forest Reference Emission Level). The jurisdictional boundary used is the national boundary
Ecoregion	All the project plots were under 'Chhota-Nagpur Plateau' eco region[30]. Therefore, area outside this eco region was excluded from the donor pool area.
Policy environment	There is no subnational government-funded programs providing incentives for tree planting in the project area
Outside any registered AFOLU project	The donor pool area excludes AFOLU projects registered under Verra. Currently there is no AFOLU projects registered in the region.[31]
Land tenure	The project area is on private land; therefore, any protected areas in the project region have been excluded from the donor pool area.[32]
Distance from project plot	Areas beyond a 100 km radius of the centroid of each project plot were excluded

The series of above-mentioned GIS layers along with elevation and land use land capability classification have been overlapped to determine the donor pool area.

2) Evaluation of project plots

The designated donor pool area was segmented into non-overlapping units, each measuring 0.36 hectares (60 m × 60 m). These units were defined to ensure that plot sizes remain within ±20% of the average size of the project's implementation plots, in accordance with methodological consistency.

To facilitate the selection of appropriate control plots, the project employed the Normalized Difference Vegetation Index (NDVI) as a Stocking Index (SI). NDVI composites were generated from satellite imagery of the project area, ensuring spatial consistency across years. Using Google Earth Engine, SI values were extracted annually from 2013 to 2023 for both potential control plots and the corresponding project plots. A regression analysis was performed to model the SI values of each plot over time, allowing for the identification of trends in vegetation dynamics.

To quantitatively match control plots to project plots, a multivariate distance (MD) was calculated for each potential control plot. The Euclidean distance metric was used to evaluate similarity across the vector of covariates relative to each project plot, facilitating an objective selection of baseline-equivalent control areas.

Table: Covariates and source of data used to delineate the donor pool area.

[30] Terrestrial Ecoregions of the World | Publications | WWF

[31] Verra Registry: https://registry.verra.org/app/search/VCS/All%20Projects

[32] WDPA: World Database on Protected Areas (polygons) by UN Environment World Conservation Monitoring Centre (UNEP-WCMC) / Protected Planet

Factor	Description
Stocking Index	The Normalized Difference Vegetation Index (NDVI) was employed for the years 2013, 2017, and 2022 to assess vegetation cover over time. NDVI values were calculated using imagery from the months of September, October, and November, selected to coincide with the period immediately following the wet season. This period optimizes vegetation signal strength and improves data quality by increasing the availability of cloud-free satellite imagery. NDVI composites were derived from Sentinel-2A surface reflectance products for the years 2017, 2020, and 2023. NDVI is a well-established metric with a strong positive correlation to above-ground biomass, making it an effective tool for monitoring vegetation dynamics and productivity. To enhance the temporal resolution and accuracy of biomass estimation, NDVI data from additional years may be incorporated in future analyses. Furthermore, the use of additional spectral indices (SIs) may be considered, where appropriate, to complement NDVI and improve analytical robustness.

3) Selection of control plots

To match control plots with project plots, apply a k-nearest neighbor optimal matching approach without replacement. Five (k) control plots will be matched to each project plot, and it will remain same for the project lifetime).

The control plots with the lowest multivariate distance metric values have been selected by and derived for relative weights proportional to the inverse of the multivariate distance metric value, that sum to 1 (Equation (A1)).

$$W_{control,i,j} = \frac{e^{-MD_{i,j}}}{\sum_{j=1}^{n_{i,j}} e^{-MD_{i,j}}} \quad \text{(A1)}$$

Where:

$W_{control,i,j}$ = 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)

Step 3: Evaluation of match quality and finalizing matching

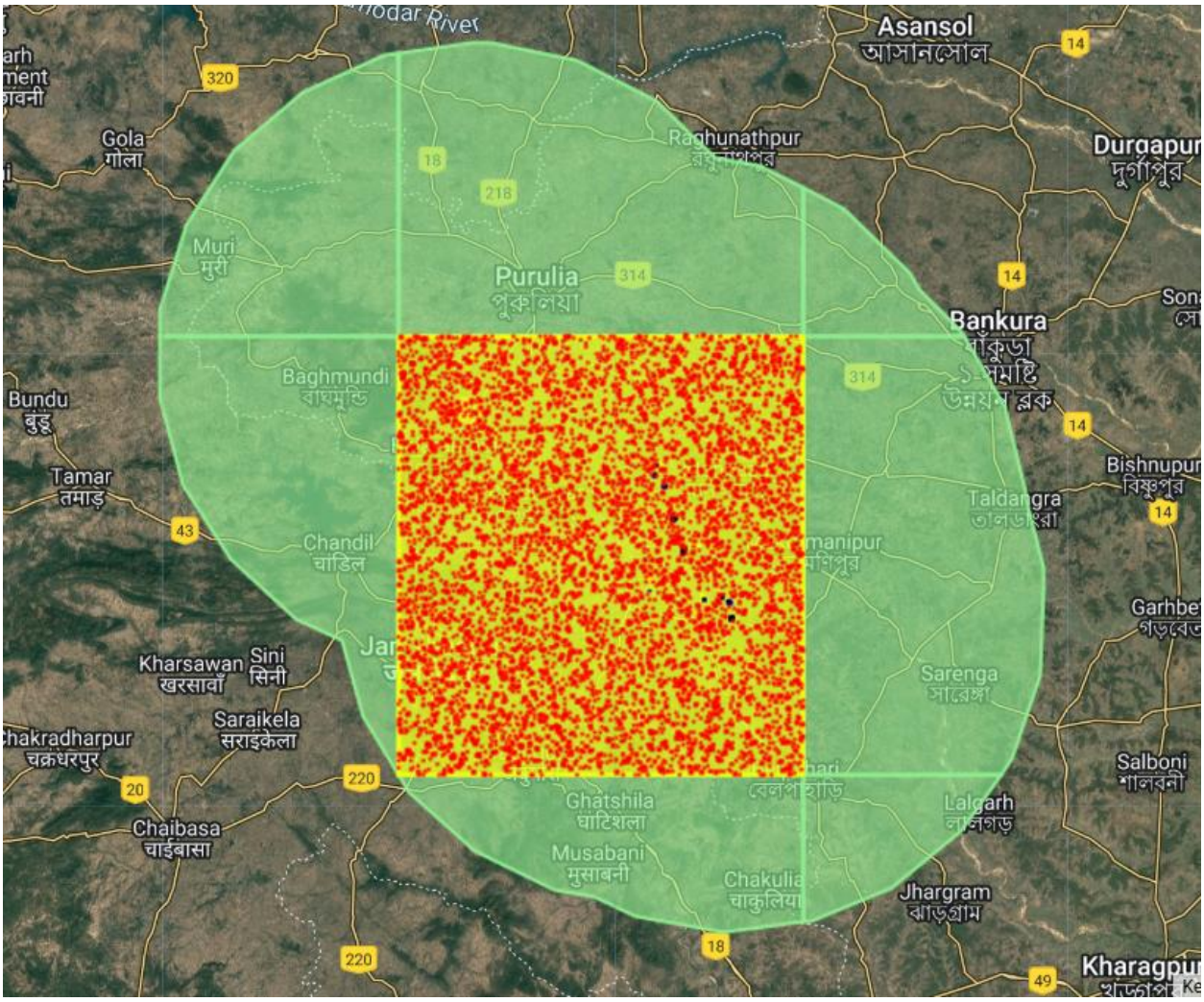
For each included matching covariate x, the standardized difference of means (SDM) have been calculated as:

$$SDM = ABS(\overline{x}_{wp,x} - \overline{x}_{bsl,x}) / \sqrt{(\frac{\sigma^2_{wp,x} + \sigma^2_{bsl,x}}{2})} \quad \text{(A2)}$$

Where:

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

Overall match results are deemed valid when SDM for each covariate is less than the critical threshold of 0.25. The final selection of control plots and their respective weights are then fixed, the UTM coordinates recorded, and databased. The standard difference of means between the population of project and control plots for each covariate is less than the 0.25 critical, indicating a valid matching.



Location of control plots in the donor pool area (yellow colored).

Step 4: Monitoring of control and project plots

At each monitoring event, control plots may be removed as invalid if they are within any operating subnational government-funded program providing incentives for tree planting, implemented during the evaluation period, to which the project area is not subject; or within the boundaries of any AFOLU projects registered under a carbon offset program (optional). Where a control plot is deemed invalid, the plot will be excluded and replaced from the donor pool defined above. Weights of the control plots will be recalculated to sum to 1. For each remaining valid control and project plot, stocking index will be revaluated from the most recent imagery.

Step 5: Derivation and evaluation of slopes for time series of stocking indices

The project defined a time series of $\Delta SI_{control,\,t}$ and $\Delta SI_{wp,\,t}$ values from time t = 0 to time t, estimated across the sample populations of project and control plots.

To be included in the dataset, SI values must be available at time t for the project plot i and all of its matched control plots i , j . Where SI values for plots within a matched set are not available at time t, (e.g., due to cloud cover or temporary sensor issues), the matched set of project and control plots (i) will not be used in the derivation of $\Delta SI_{control,\,t}$ and $\Delta SI_{wp,\,t}$ at each time t . A minimum of n = 30 project plots will be used to have a representative sample of the area.

The rate of increase in stocking index in the control and project plots, $\Delta SI_{control,\ t}$ and $\Delta SI_{wp,\ t}$ is 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 are calculated as:

$$W_{control,i,j,t} = W_{control,i,j} \times \frac{1}{\sum_{t=0}^{t} n\_rs_t} \quad \text{(A3)}$$

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 with (*k*) matched control plots with values assessed at time *t*

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

$$W_{wp,i,t} = \frac{1}{\sum_{t=0}^{t} n\_rs_t} \quad \text{(A4)}$$

Where:

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

WSLR is used to derive $\Delta SI_{control,t}$ in Equation (A5) and $\Delta SI_{wp,t}$ in Equation (A6). These equations estimate the slope of stocking index over time by calculating the weighted covariance between time and stocking index, divided by the weighted variance of time.

$$\Delta SI_{control,t} = \frac{\sum_{i,j}\left(W_{control,i,j,t} \times t \times SI_{control,i,j,t}\right) - \frac{\sum_{i,j}(W_{control,i,j,t} \times t) \times \sum_{i,j}(W_{control,i,j,t} \times SI_{control,i,j,t})}{\sum_{i,j}(W_{control,i,j,t})}}{\sum_{i,j}(W_{control,i,j,t} \times t^2) - \frac{\left(\sum_{i,j}(W_{control,i,j,t} \times t)\right)^2}{\sum_{i,j}(W_{control,i,j,t})}} \quad \text{(A5)}$$

Where:

$\Delta SI_{control,t}$	=	Slope of stocking index of control plots over time
$W_{control,i,j,t}$	=	Weight of control plot *j* matched to project plot *i*, at time *t*
$SI_{control,i,j,t}$	=	Stocking index of control plot *j* matched to project plot *i*, at time *t*
t	=	1, 2, 3, …, *t* years elapsed since the project start date

In Equation (A5), weights of control plots $W_{control,i,j,t}$ are calculated using Equation (A1), which reflects the relative representativeness of each control plot, and Equation (A3), which adjusts these weights over time based on the cumulative number of matched control plots. These weights are applied in the regression to reflect confidence in the quality of observation matching, based on pre-project conditions, and moderate the relative influence of each individual control plot observation as the data set grows over time.

$$\Delta SI_{wp,t} = \frac{\sum_{i}\left(W_{wp,i,t} \times t \times SI_{wp,i,t}\right) - \frac{\sum_{i}(W_{wp,i,t} \times t) \times \sum_{i}(W_{wp,i,t} \times SI_{wp,i,t})}{\sum_{i}(W_{wp,i,t})}}{\sum_{i}(W_{wp,i,t} \times t^2) - \frac{\left(\sum_{i}(W_{wp,i,t} \times t)\right)^2}{\sum_{i}(W_{wp,i,t})}} \quad \text{(A6)}$$

Where:

$\Delta SI_{wp,t}$	=	Slope of stocking index of project plots over time
$W_{wp,i,t}$	=	Weight of project plot *i* at time *t*
$SI_{wp,i,t}$	=	Stocking index of project plot i at time *t*
t	=	1, 2, 3, …, *t* years elapsed since the project start date

In Equation (A6), weights of project plots Wwp,i,t are calculated using the assigned weights from Equation (A4), which scale the cumulative number of project plots included in the analysis from t = 0 to time t. This ensures that all project plot observations are weighted equally while normalizing their relative influence as the number of observations grows over time. The significance of the difference between ΔSIcontrol,t and ΔSIwp,t is evaluated with a Z test to assess common practice additionality, as follows:

$$Z = \frac{\Delta SI_{wp,t} - \Delta SI_{control,t}}{\sqrt{SE^2_{\Delta SI\_wp,t} + SE^2_{\Delta SI\_control,t}}} \quad \text{(A7)}$$

Where:

Z	=	Z value (unitless)
$\Delta SI_{control,t}$	=	Weighted average annual increase (slope) in stocking index *SI* in control plots through time *t*
$\Delta SI_{wp,t}$	=	Weighted 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

Where the absolute value of Z is equal to or exceeds 1.96, parameters $\Delta SI_{control,t}$ and $\Delta SI_{wp,t}$ are deemed significantly different.

Step 6: Deriving performance benchmark

If $\Delta SI_{control,\,t}$ and $\Delta SI_{wp,\,t}$ are not significantly different, as determined above, then the performance benchmark is set equal to 1. If $\Delta SI_{control,\,t}$ is negative or is statistically insignificant at a $P < 0.05$ level, then the performance benchmark is set equal to 0.

Otherwise, the performance benchmark is equal to the ratio of slopes:

$$PB_t = \Delta SI_{control,t} \times \frac{1}{\Delta SI_{wp,t}} \quad \text{(A8)}$$

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 year *t*
$\Delta SI_{wp,t}$	=	Average annual increase in stocking index, *SI*, in project plots through year *t*
t	=	1, 2, 3, ..., *t* years elapsed since the project start date

Where the slope coefficient of the control plots ($\Delta SI_{control,t}$) is insignificant ($P > 0.05$) or less than zero, $\Delta SI_{control,t}$ is set equal to zero in Equation (A8).