PROJECT REIGNITE: TURNING FARM WASTE TO CLIMATE ACTION

METHODOLOGY UPGRADE

Project title	Project Reignite: Turning Farm Waste to Climate Action
Project ID	4679
Crediting period	16 October 2023- 15 October 2030
Monitoring periods selected for requantification	16 October 2023- 30 June 2024
Original date of issue	14 October 2025
Most recent date of issue	14 October 2025
Version	1
***VCS Standard* Version**	4.7
Previous applied methodology	VM0044 1.1
New applied methodology	VM0044 1.2
Prepared by	Together for Restoration Team

CONTENTS

1 PROJECT DETAILS

1.1 Summary of Updates to Project Description

Through this Requantification Report, The project is upgrading from Version 1.1 of methodology VM0044 to Version 1.2. The significant change between the two versions of the methodology is the addition of Investment Analysis as a step in the additionality assessment of the project. The project description is updated to apply the procedures and requirements of the most recent version of VCS tool VT0008 Additionality Assessment to conduct an investment analysis (Step 3) through an investment comparison analysis (Option 1).

Project description section	Description and justification of revision
3.5	*The project adds a Step 3 in Additionality Assessment: Investment Analysis and uses Investment Comparison Analysis*

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
Validation	*October 2023-October 2030*	*VCS*	*RINA S.p.A*	*7 years*
First Verification	*16 October 2023-30 June 2024*	*VCS*	*RINA S.p.A*	*8.5 Months*
Requantification audit	October 2025	VCS	*RINA S.p.A*	1 Week

1.3 Project Proponent

Organization name	SRCNatura Sure Pvt. Ltd.
Contact person	Mr. Rajesh Aggarwal
Title	Director
Address	Plot No. 200, Sector 56, Phase V, Kundli, Sonipat, Haryana, India-131028

Telephone	+91 9582433509
Email	team@togetherforrestoration.org

1.4 Other Entities Involved in the Project

No other entity is involved.

1.5 Project Crediting Period

Crediting period	X *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	16 October 2023- 30 October 2030

1.6 Project Location

There are no changes in the Project Location.

The location of Project Reignite (grouped project) is India. The geographical boundary for projects located in India is delineated in the form of extreme geographic coordinates of India as:

Latitude - 8°4' to 37°6' N, Longitude - 68°7' to 97°25' E

The first project activity instance is in the state of Odisha, India. The state of Odisha extends from 17.31N latitude to 22.31N latitude and from 81.31E longitude to 87.29E longitude.

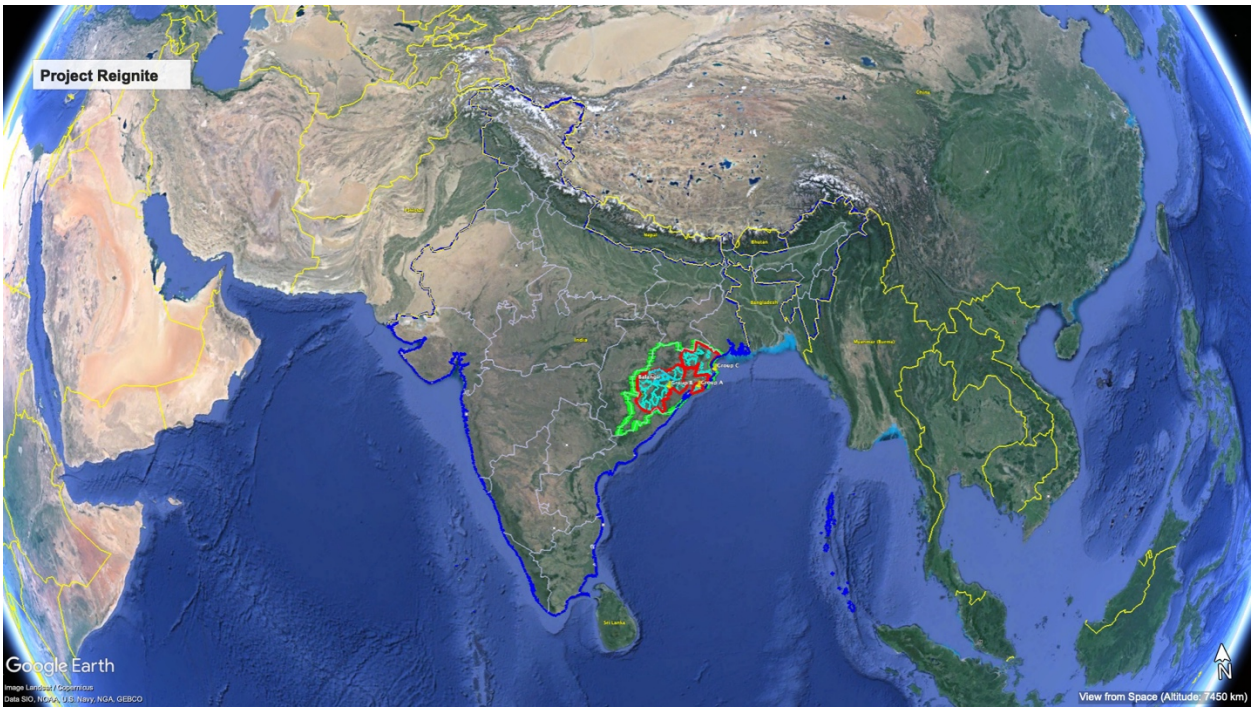
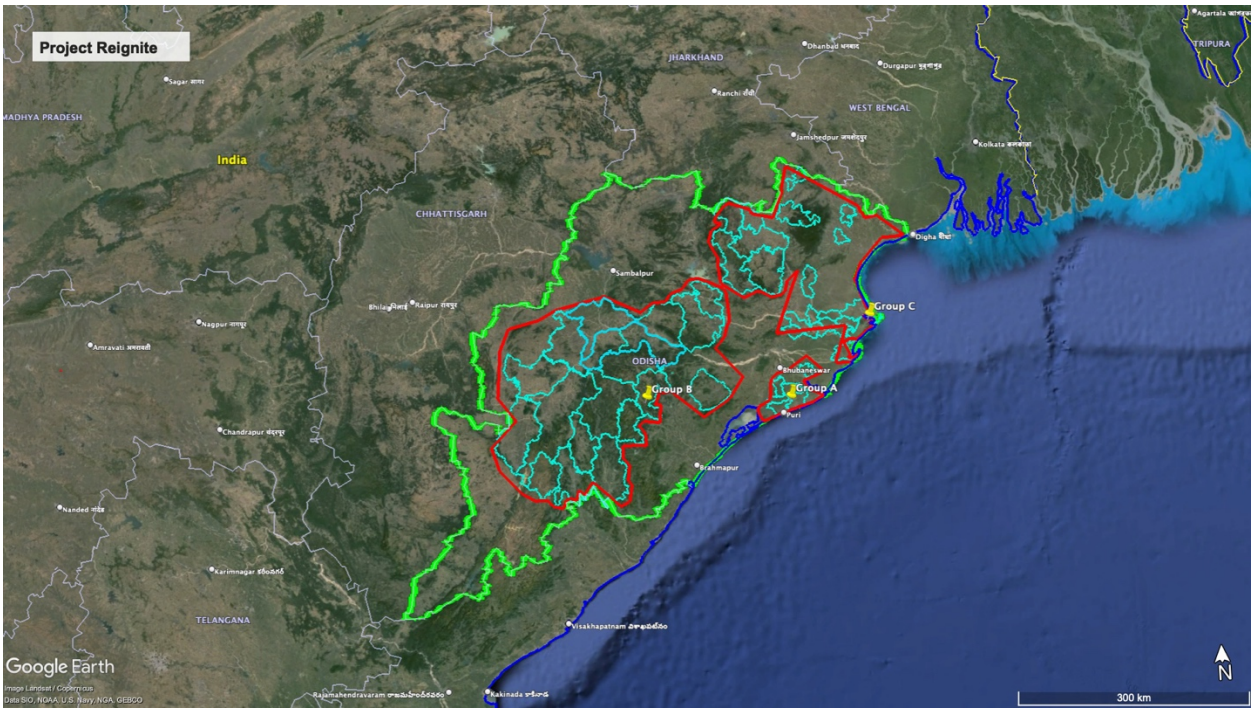
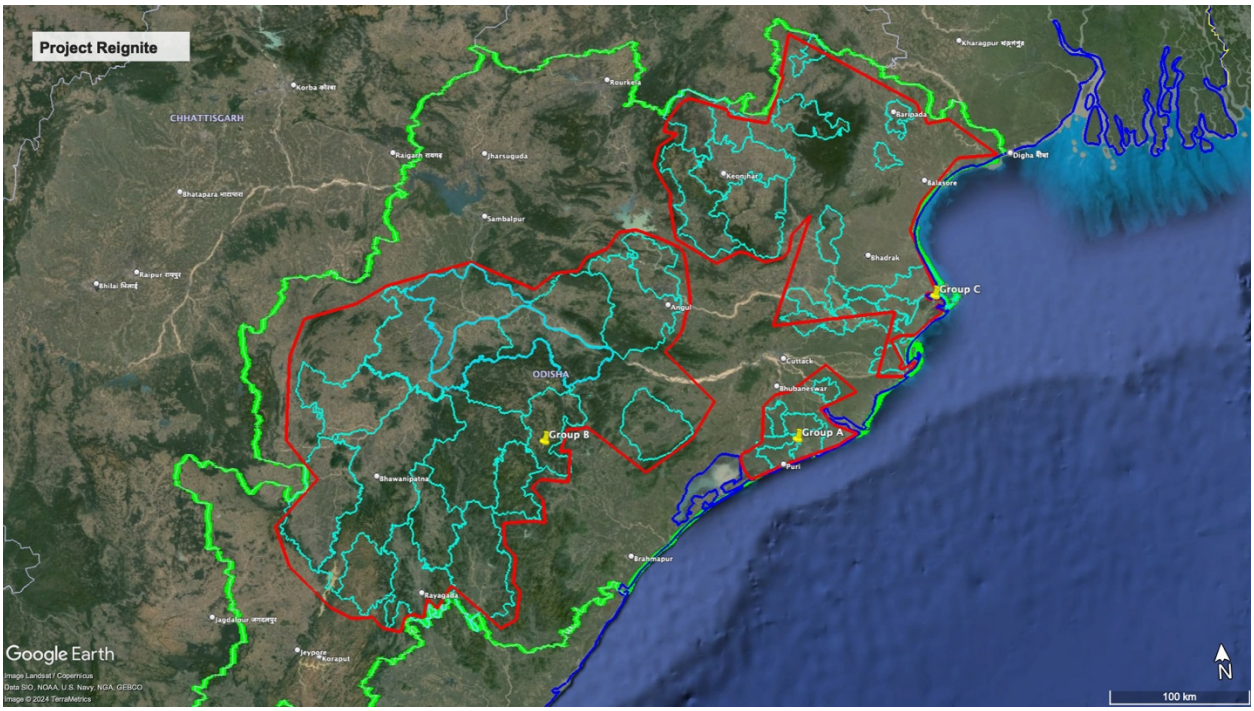


Figure. 2. Map outlining Project Reignite's location.



State of Odisha marked in Green



Groups A, B, and C of farmers in the state of Odisha

Group A

Group B

Group C

1.7 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	*VM0044*	*Biochar Utilization in Soil and Non-Soil Applications*	*1.2*
Tool	*VT0008*	*Additionality Assessment*	*1.0*

1.8 Commercially Sensitive Information

There is no project related commercially sensitive information excluded from this document.

2 IMPLEMENTATION STATUS

2.1 Deviations

2.1.1 Methodology Deviations

There are no changes in the methodology deviations previously applied in the validation and first verification of the project. No deviations are proposed, other than those listed in the table below.

Table: Methodology Deviations Applied

S. No.	Parameter	Requirement of the methodology	Proposed Deviation
1)	Moisture content for calculation of biochar on dry weight basis	Frequency of recording: Moisture content should be monitored for each batch of biochar type *t*.	Frequency of monitoring will be on a monthly basis for random samples of biochar produced of type *t*. The field sample size will be determined using the Standard for Sampling and Surveys for CDM project activities and programme of activities as a guideline.
2)	H:C_{org} (Ratio of hydrogen to organic carbon) of biochar produced	Frequency of recording: Each batch of biochar produced at the production facility *p*.	Frequency of monitoring will be on an annual basis for random samples of biochar produced of type *t*. The field collection sample size will be determined using the Standard for Sampling and Surveys for CDM project activities and programme of activities as a guideline.

2.1.2 Project Description Deviations

There are no additional project deviations applied in this requantification request. Please find below the project description deviations applied in the first verification of the project.

This monitoring period makes two additions to the project compared with the Project Description. They are as follows:

1. Addition of Moisture Content of Biomass as a Monitoring Parameter
2. Addition of Cotton Stalks as a biomass

Please find below the descriptions of requirements set forth by VCS Standard 4.7 for PD Deviations:

1. Addition of Moisture Content of Biomass as a Monitoring Parameter

To enhance the quality of biochar production, the project has introduced a new monitoring parameter: biomass moisture content. This parameter ensures that only suitable biomass is used in the production process.

Field officers are equipped with handheld moisture meters and are responsible for checking the moisture content of biomass before each batch of biochar is produced. For each batch, a field

officer randomly collects a handful of biomass and uses the moisture meter to measure its moisture content.

If the biomass moisture content is below 15%, the officer authorizes the producer to proceed with biochar production. If it is above 15%, the biomass must undergo additional sun or air drying before it can be used. Although biomass naturally tends to dry below 15% moisture due to exposure to heat, this monitoring step has been added to formalize quality control.

As an additional safeguard, the project suspends biochar production during July, August, and September, corresponding to the monsoon season. During this period, higher ambient humidity makes it difficult to maintain biomass at the required moisture levels. The addition of this parameter makes the monitoring plan more complete and ensures better control over the production process. Also, it improves the quality of the biochar output. The inclusion of this parameter has no effect on the applicability of the methodology, validity of the baseline scenario and the project additionality. Therefore, adding this parameter is in line with the paragraph 3.21 of the VM 0044 v1.2 methodology.

2. Addition of Cotton Stalks as a biomass

The project has introduced an additional biomass: cotton stalks. Cotton Stalks are woody stems of the cotton plant and are residues of the cotton crop. They are commonly burnt by smallholder farmers in India. As cotton stalks are of the same nature and similar carbon content as tree pruning, it can be classified under woody biomass. The deviation positively impacts the project and matches the baseline, additionality, and applicability conditions of other types of biomasses in the project.

- Whether the deviation impacts the applicability of the methodology, the project additionality, or the appropriateness of the baseline scenario.
    - As per the VCS Standard v4.7, paragraph 3.21, the biomass matches all the applicability conditions of the methodology, additionality, and the baseline. In summary, cotton stalks, which are biogenic in origin, are also subjected to open field burning in the baseline scenario and is subjected to the flame curtain pyrolysis to produce biochar, which is applied in the same farms where the biomass originates from. Also, the cotton stalks are locally grown and sourced; do not need to be imported from other regions or districts and fulfill the sustainability conditions for eligible biomass types, as justified in the tables below.
    - Further, the choice of cotton stalks as a waste biomass type to be used for biochar making has no effect on the additionality of the project, because the project is additional merely by its being on the positive list and the types of biomass used has no bearing on its additionality.
    - The project proponent (1) sources waste biomass, (2) produces biochar and (3) ensures the biochar is utilized in soil application. Cotton Stalks meet the following applicability conditions, same as other biomasses in the project:

2.2 Baseline Reassessment

Is the project subject to baseline reassessment requirements? *(e.g., refer to Sections 3.2.6 and 3.2.7 of the VCS Standard, v4.7)*

☐ Yes ☒ No

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

The data below has no changes and remains the same as validation of the project

<table>
<tr><td>Data / Parameter</td><td>$F_{Cp,t,p}$</td></tr>
<tr><td>Revised/different from original project description?</td><td>No</td></tr>
<tr><td>Data unit</td><td>Percent (%)</td></tr>
<tr><td>Description</td><td>Organic carbon content of biochar for each biochar type t produced in production facility p per tonne of biochar, on a dry weight basis (%)</td></tr>
<tr><td>Source of data</td><td>At validation stage, default values provided in Table 4AP.1 are used, which are taken from IPCC (2019) Appendix 4: Method for Estimating the Change in Mineral Soil Organic Carbon Stocks from Biochar Amendments: Basis for Future Methodological Development</td></tr>
<tr><td>Value applied</td><td>
<table>
<tr><th>Feedstock Type</th><th>Feedstock</th><th>Organic Carbon Content</th></tr>
<tr><td>Rice husks and rice straw</td><td>Paddy Straw</td><td>0.49</td></tr>
<tr><td rowspan="2">Wood</td><td>Tree Pruning</td><td rowspan="2">0.77</td></tr>
<tr><td>Bamboo Pruning (Only taken from mature bamboo with woody stems)</td></tr>
<tr><td rowspan="3">Herbaceous</td><td>Maize Cobs</td><td rowspan="3">0.65</td></tr>
<tr><td>Ipomoea Carnea</td></tr>
<tr><td>Water Hyacinth</td></tr>
</table>
</td></tr>
</table>

Justification of choice of data or description of measurement methods and procedures applied	At validation, IPCC (2019) stated global estimates of organic carbon content of biochar as a function of feedstock and heating temperature are used. During the project implementation (crediting period,) the values will be monitored using biochar material analysis at an accredited laboratory for calculation.
Purpose of Data	Calculation of project emissions
Comments	Below are the reasonings for classification of each feedstock type: 1. Paddy Straw: Category: Rice husks and rice straw Reasoning: Paddy straw is the residue left after the rice grain is harvested. Given its direct relation to rice production, it is most appropriately classified with rice husks and straw. 2. Tree Pruning: Category: Wood Reasoning: Tree prunings are derived from trees, which are inherently woody plants. The pruned branches and twigs have the same woody characteristics as the main tree and are therefore classified under wood. 3. Bamboo Pruning: Category: Wood Reasoning: While bamboo is technically a grass, mature bamboo develops a woody stem known as a culm. These woody culms give bamboo its rigidity and strength, making it akin to wood in many applications. Thus, for purposes of biomass classification, mature bamboo pruning will be categorized as wood. 4. Maize Cobs: Category: Herbaceous Reasoning: Maize (or corn) is a type of grass, and while the cob is harder and more rigid than the rest of the plant, it does not have the woody properties found in trees or mature bamboo. Therefore, it fits best under the herbaceous category. 5. Ipomoea Carnea: Category: Herbaceous Reasoning: Ipomoea Carnea is a type of forb. Forbs are broad-leaved herbaceous plants, and thus, they fit squarely within the herbaceous category.

	6. Water Hyacinth: Category: Herbaceous Reasoning: Water hyacinth is a free-floating perennial aquatic plant. Its rapid growth and herbaceous nature make it best suited for the herbaceous category.

Data / Parameter	$PR_{de,k}$
Revised/different from original project description?	*No*
Data unit	Dimensionless
Description	Permanence adjustment factor due to decay of biochar (dimensionless) defined for application type k
Source of data	IPCC (2019) Appendix 4: Method for Estimating the Change in Mineral Soil Organic Carbon Stocks from Biochar Amendments: Basis for Future Methodological Development
Value applied	"The temperature in the main pyrolysis zone just below the flame curtain is 680°C to 750°C and cools down slowly below the main pyrolysis zone when new feedstock layers are added to 150–450°C depending on the duration of batch before final quenching" (Cornelissen et al. 2016). As pyrolysis temperature for flame curtain pyrolysis method is known to be >600°C and as observed in practice, permanence adjustment factor is 0.89 from IPCC (2019) Appendix 4 AP.2.
Justification of choice of data or description of measurement methods and procedures applied	Biochar is a stable material that may be used for soil and non-soil applications. As a material, it has a decay rate that must be accounted for. This parameter considers how much of the original carbon will remain in the biochar and may be accounted as a carbon sink after its final application. IPCC and EBC are internationally recognized, and the data provided in the guidelines are peer reviewed.
Purpose of Data	Calculation of project emissions

Comments	The methodology suggests that for low technology production facilities, project proponents must use a conservative default value of 0.56. The conservative default value is suggested only in case the pyrolysis temperature is unknown (Figure 4Ap.1 in IPCC, 2019). However, in the case of Project Reignite, pyrolysis temperature is known to be higher than 600°C as flame curtain pyrolysis method is used in steel-shield soil pit. The project activity has been process tested for the average production temperature by a laboratory and the report will be available at the time of validation. The project activity has been process tested for the average production temperature by a laboratory and it was found that the temperature was higher than 600 degrees Celsius. In addition, Tprod is measured on a continuous basis for each batch of biochar and is a monitoring parameter.

Data / Parameter	GWP_{CH4}
Revised/different from original project description?	*No*
Data unit	Tonnes CO2e per tonne CH4 (tCO2e/ tCH4)
Description	Global warming potential of methane
Source of data	IPCC Fifth Assessment Report
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	The VCS Standard V4.4 requires that CH4 is converted to CO2e using the 100-year global warming potential derived from IPCC Fifth Assessment Report.
Purpose of Data	Calculation of project emissions
Comments	The latest standard version at the time of listing suggested GWP_{CH4} to be 28. The latest IPCC Assessment Report (Sixth) suggested GWP_{CH4} to be 21. However, a conservative value of 28 is applied.

Data / Parameter	Fe
Revised/different from original project description?	*No*

Data unit	tonnes CH4 per tonne biochar (t CH4/t)
Description	Average methane emissions from producing one tonne of biochar in year y in a low technology production facility
Source of data	Table 3 in Cornelissen et al. (2016)
Value applied	14kg CH4/ tonne of biochar for steel-shield soil pit
Justification of choice of data or description of measurement methods and procedures applied	Methane emissions must be accounted for as methane is the main gas released from low technology production facilities. The value of methane emissions per tonne of biochar produced in a steel-shield soil pit (low-technology production facility) has been taken from Table 3 in Cornelissen et al. (2016).
Purpose of Data	Calculation of project emissions
Comments	None

Data / Parameter	Biomass categories and quantities used for selection of the baseline scenario and production of biochar utilized in the project activity
Revised/different from original project description?	*No*
Data unit	tonnes (t) on dry basis

Description

Biomass Categories and Quantities at each production facility[12]:

Feedstock Type	Feedstock	Estimated Amount available at baseline (in tonnes) each year
Agricultural Waste Biomass	Rice Straw	57
	Tree Pruning	6
	Bamboo Pruning	12
	Maize Cobs	6
	Ipomoea Carnea (Shrub)	6
Aquaculture Plants	Water Hyacinth (Eichhornia crassipes)	3

Biomass Quantities available at all production facilities (derived from the above values):

Feedstock Category	Feedstock	Estimated Amount available at baseline (in tonnes) each year
Agricultural Waste Biomass	Rice Straw	285,000
	Tree Pruning	30,000
	Bamboo Pruning	60,000
	Maize Cobs	30,000
	Ipomoea Carnea (Shrub)	30,000
Aquaculture Plants	Water Hyacinth (Eichhornia crassipes)	15,000

- Biomass is sourced from the same/neighboring farm where the production facility is located.
- Biomass would have been burnt in the open field or left to decay in the absence of the project activity. Details are provided in Section 3.4.
- Sustainability criteria for all biomass is met. It is described in Section 3.2.

Source of data

Expert judgement based on on-site assessment of biomass categories and quantities

Description of measurement methods and procedures applied	Using weight meters and moisture meters. Adjusted by moisture content in order to determine the quantity of dry biomass.
Frequency of Monitoring/ recording	Data monitored once before validation
QA/QC procedures to be applied	Cross-check the measurements with an annual mass balance.
Purpose of Data	Monitoring of eligible biomass categories and quantities used as feedstock for production of biochar
Comments	For each biochar type *t* to be produced, a laboratory has performed field testing for yield rates. Results will be available at the time of validation.

3.2 Data and Parameters Monitored

Data / Parameter	$M_{p,y}$
Revised/different from original project description or monitoring report(s)?	*No*
Data unit	tonnes (t)
Description	Total mass on a dry weight basis of biochar produced in production facility p in year y
Source of data	On-site measurements
Description of measurement methods and procedures to be applied	Total weight of biochar produced at production facility p in year y will be measured using a weighing scale. Moisture content will be monitored for the project using laboratory analysis of representative sampling of biochar produced every month from the beginning of the crediting period.
Frequency of monitoring/recording	Monitored continuously, recorded for each batch produced and summed as a total
Monitoring equipment	Weighing scale as per details provided for $M_{t,k,p,y}$ below.
QA/QC procedures to be applied	Calibration of weighing scales on-site by the Reignite monitoring team (defined in Section 5.3) using a known weight to be done annually.

[12] Estimates are based on expert judgement.

Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Biochar quantity will be weighed separately using a weighing scale for each biochar type t at each biochar production facility p. The sum is recorded as $M_{p,y}$

Data / Parameter	$M_{t,k,p,y}$
Revised/different from original project description or monitoring report(s)?	*No*
Data unit	tonnes (t)
Description	Mass on dry weight basis of biochar type t and application type k produced at production facility p in year y
Source of data	On-site measurements
Description of measurement methods and procedures to be applied	Total weight of biochar type t, used for application type k, produced at production facility p in year y will be measured using a weighing scale. Moisture content will be monitored for the project using laboratory analysis of representative sampling of biochar produced every month from the beginning of the crediting period.
Frequency of monitoring/recording	Monitored continuously, recorded for each batch applied
Monitoring equipment	Weighing scale Specification: Aliston Electronic Portable Fishing Hook Type Digital LED Screen Weighing Scale
QA/QC procedures to be applied	Calibration of weighing scales on-site by the Reignite monitoring team (defined in Section 5.3) using a known weight, to be done annually.
Purpose of data	Calculation of project emissions
Calculation method	N/A

Comments	Biochar quantity will be weighed separately using a weighing scale for each biochar type t at each biochar production facility p. Moisture content will be measured using testing done by a laboratory every month from the start date of the project. Field sampling will be done using the Sampling and Surveys Standard for CDM Project Activities and Program of Activities, as a guideline. The laboratory will be using a representative sample from the field samples for testing. The laboratory will follow ASTM D1762-84 Standard Test Method for Chemical Analysis of Wood Charcoal or a similar testing method. The dry weight of biochar will be measured using the results.

Data / Parameter	T_{prod}
Revised/different from original project description or monitoring report(s)?	*No*
Data unit	Degrees Celsius (C)
Description	Average annual production temperature during pyrolysis
Source of data	Data records of biochar production
Description of measurement methods and procedures to be applied	Use instruments with recordable electronic signal (digital).
Frequency of monitoring/recording	Continuous, monitored for each batch produced, aggregated to annual averages
Monitoring equipment	Handheld high temperature industrial infrared thermometer
QA/QC procedures to be applied	Periodic calibration against a primary device provided by an independent NABL accredited laboratory.
Purpose of data	Calculation of project emissions
Calculation method	N/A

Comments	It was determined through tests conducted by an external laboratory that the temperature achieved during the steel shield soil pit pyrolysis process is in excess of 600 degrees C. The laboratory was commissioned to conduct a series of temperature measurements, while the pits were charged with the biomass and the pyrolysis process was being carried out. The laboratory results showed that the temperature during the pyrolysis was always more than 600 degrees C. This supports the value of PRde,k taken as 0.89 corresponding to temperatures above 600 degrees C.

Data / Parameter	$F_{Cp,t,p}$
Revised/different from original project description or monitoring report(s)?	*No*
Data unit	Percent (%)
Description	Organic carbon content of biochar for each biochar type t produced in production facility p per tonne of biochar, taken on a dry weight basis
Source of data	Laboratory material analysis
Description of measurement methods and procedures to be applied	Laboratory material analysis following EBC Production Guidelines on the production of biochar will determine F_{Cp} values on a regular basis.
Frequency of monitoring/recording	Testing will be performed annually as there will not be a material change in feedstock or thermochemical production parameters more frequent than annually.
QA/QC procedures to be applied	Laboratory accredited by India's national agency NABL (National Accreditation Board for Testing and Calibration Laboratories).
Purpose of data	Calculation of project emissions
Calculation method	N/A
Comments	Field sampling will be done using the Sampling and Surveys for CDM Project Activities and Program of Activities Standard as a guideline. The lab will be using a representative sample from the field samples for the testing.

Data / Parameter	$H:C_{org}$

Revised/different from original project description or monitoring report(s)?	*No*
Data unit	Dimensionless
Description	Ratio of hydrogen to organic carbon
Source of data	Laboratory analysis
Description of measurement methods and procedures to be applied	Nationally Accredited Laboratory analysis following EBC Production Guidelines.
Frequency of monitoring/recording	Annually field samples will be collected using the Sampling and Surveys Standard for CDM Project Activities and Program of Activities as a guideline. Laboratory will be using a representative sample out of the field samples collected using Sampling.
QA/QC procedures to be applied	Laboratory accredited by India's national agency NABL (National Accreditation Board for Testing and Calibration Laboratories).
Purpose of data	Used to demonstrate eligibility for use in soil applications. As per applicability condition 10, biochar used in soils must have an $H:C_{org}$ of less than 0.7.
Calculation method	N/A
Comments	As all production facilities will be utilizing the same technology and same feedstocks, a representative sample will be tested annually. Field sampling will be done using the Sampling and Surveys Standard for CDM Project Activities and Program of Activities as a guideline. Laboratory will be taking a representative sample from the field samples.

Data / Parameter	Moisture Content of Biomass (Additional Project Parameter)
Revised/different from original project description or monitoring report(s)?	*No*
Data unit	%

<table>
<tr><td>Description</td><td>Moisture content of biomass being used for biochar production</td></tr>
<tr><td>Source of data</td><td>Data records of biochar production</td></tr>
<tr><td>Description of measurement methods and procedures to be applied</td><td>Use instruments with recordable electronic signal (digital).</td></tr>
<tr><td>Frequency of monitoring/recording</td><td>Continuous, monitored for each batch produced to verify eligibility of biomass</td></tr>
<tr><td>Values Monitored</td><td><table><tr><th>Type of Biomass</th><th>Moisture Content of Biomass Range</th></tr><tr><td>Paddy Straw and Roots</td><td>Lower than 15%</td></tr><tr><td>Tree Pruning</td><td>Lower than 15%</td></tr><tr><td>Cotton Stalks</td><td>Lower than 15%</td></tr><tr><td>Bamboo Pruning</td><td>Lower than 15%</td></tr><tr><td>Ipomoea Carnea</td><td>Lower than 15%</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>Handheld moisture meter</td></tr>
<tr><td>QA/QC procedures to be applied</td><td>Periodic calibration as per the device manufacturer.</td></tr>
<tr><td>Purpose of data</td><td>Eligibility of biomass for biochar production</td></tr>
<tr><td>Calculation method</td><td>N/A</td></tr>
</table>

Comments	Project Reignite has introduced a project parameter by going beyond the methodology to ensure high quality biochar production. A random sample of biomass is extracted and used for each batch of biochar production to check the moisture content of the biomass. If the moisture content is beyond 15%, the biomass is not eligible for biochar production and is subject to additional drying in the air and under the sun. If the moisture content is below 15%, the farmer proceeds to make the biochar. The parameter is not required for the quantification; however, it is used to ensure production of high-quality biochar and ensuring the integrity of the process.

3.3 Monitoring Plan

Main Objective

The main objective of the monitoring was to prove the carbon sink from the final application of biochar and to quantify the emissions resulting from the project activity during the project crediting period and presented for each verification. This process will continue to be used in future verifications to ensure ongoing accuracy and reliability of the project's carbon sink and emission quantifications.

Sampling approach

For the periodic monitoring of parameters $M_{p,y}$ and $M_{t,k,p,y}$ described in the monitoring plan in section 5.2 above, the values of weight of the biochar produced and applied will be measured and recorded for every batch of biochar produced. These values being weights of dry biochar produced, will be derived by subtracting the moisture content of the biochar from the total weight measured by means of weighing scales. While the weight of each batch produced will be taken and recorded, the value of moisture content will be monitored using a sampling approach. Values of the parameters $F_{cp,t,p}$ (organic carbon content of biochar) and $H:C_{org}$ (ratio of hydrogen to carbon in the biochar) will also be determined using a sampling approach.

The sampling approach that will be followed is based on the CDM Standard for Sampling & Surveys for CDM project activities and programme of activities (Version 9.0 of the standard from EB 110 Annex 1) and the CDM Guideline on Sampling & Surveys for CDM project activities and programme of activities (version 4.0 of the guideline from EB 67 Annex 6). The sampling approach is described as below.

Step 1: Choose the parameter of interest for sampling

For all of the 3 parameters, viz., “moisture content”, “$F_{cp,t,p}$” and “$H:C_{org}$”, the parameter of interest is a mean value of the respective parameters.

Moisture content	The mean value of moisture content of the wet biochar is the desired parameter of interest
$F_{cp,t,p}$	The mean value of organic carbon content of the dry biochar is the desired parameter of interest
$H:C_{org}$	The mean value of ratio of hydrogen to carbon in the dry biochar is the desired parameter of interest

Step 2: Select the sampling scheme

As the biochar producing farms in the project are located within a single region (i.e. the state of Odisha in India), as similar in area and crop, there is homogeneity between the facilities and hence, a "Simple Random Sampling (SRS)" is appropriate for the sampling scheme.

Step 3: Determine the expected value of the parameter of interest

Pilot studies conducted through external laboratories will provide data on the range of value each parameter is expected to take. The range of value is characterized as both "mean value (μ_e)" of the parameter and "standard deviation (σ_e)".

Step 4: Select the confidence interval for the sampling

For the purpose of the sampling exercise, a confidence interval of 90/10 has been applied. The values determined by the sampling would have a level of precision of +/-10% relative to the parameter's true value, with a 90% level of confidence in the result

Step 5: Calculate the sample size for the monitoring

The sample size will be calculated as

$$n \geq \frac{1.645^2 NV}{(N-1)\times 0.1^2 + 1.645^2 V}$$

where,

n= sample size
N= total number of biochar batches produced in the project
$V= (\sigma_e/\mu_e)^2$
1.645 represents the 90% confidence required
0.1 represents the 10% relative precision

Step 6: Results of sampling

The samples, calculated as per Step 5 above will then be sent to an external laboratory for testing of 'Moisture content', '$F_{cp,t,p}$' and '$H:C_{org=}$'. The laboratory will independently carry out its tests and provide results of the test to the PP. The test results will be provided by the laboratory and will be arrived at by considering the mean values for each parameter.

Step 7: Check for the reliability of the estimate from the sampling
This step involves three further steps:

Step 7a: Find the 't-value' corresponding to the sample size (n) and confidence level (90%) from statistical tables or by using the MS Excel function TINV(0.1,(n-1)).

Step 7b: Find the standard error (ε) of the mean value estimate as

$$\varepsilon = \sqrt{\left(1 - \frac{n}{N}\right)\sigma^2/n}$$

Step 7c: Calculate the precision of the estimate as the product of 't-value' and ε

The relative precision (R.L.) is (t-value x ε)/σ_{sample}

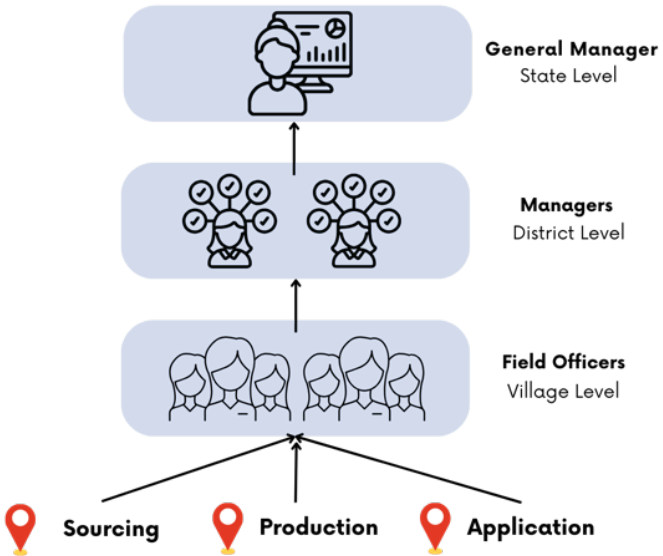
Step 7d: Reliability test:

If R.L. < 0.1 or =0.1, the estimate is reliable; the value of σ_{sample} is accepted as a reliable monitored value for the parameter (i.e. Moisture content/$F_{cp,t,p}$/H:C_{org})

If R.L. > 0.1, the estimate cannot be considered as reliable; the sampling must be repeated with a higher sample size

Organizational Structure (Roles, responsibilities, and capacity of monitoring team)

Institutionally, a permanent Reignite Monitoring Team 1 has been established for the first instance of the grouped project. A dedicated monitoring team will be established for every instance of the grouped project. The team consisted of a General Manager, Managers, and Field Officers. The General Manager has been responsible for leading the team and was appointed at the state level. Managers, specialists in agriculture, have been overseeing the work of field officers and were appointed at a district level. Their duties included on-site inspections, reviewing records, comparing new data with past figures for accuracy, and ensuring quality controls were in place. They have also been coordinating field officers to maintain consistent implementation and measurements. Field officers were responsible for field inspections of biochar production and application, further performing the data collection and using Project Reignite's internal mobile app to monitor and report ground data. All members of the team have expertise in agriculture and had experience ranging from 10 (field officers) to 35 years (general manager). They had been trained and tested by our scientific experts on biochar production and monitoring. This organizational structure and expertise will be maintained and expanded upon in future project instances to ensure the effective monitoring of biochar application and its impacts.



1. Figure 5: Structure of monitoring team

Training, Testing, and Registration of Personnel

Initially, the entire monitoring team (including the general manager, managers, and field officers) had been trained and tested by our scientific experts on biochar production and monitoring. Each biochar producer, shifting from traditional practices to biochar production to manage their farm waste, had been trained, tested, and registered in the project by the field officers. The training covered instructions on performance of activities related to sourcing, production, storage, and biochar application. Biochar producers had been assigned an ID that represents their production facility. This comprehensive training and registration process will continue to be a crucial aspect of the project's implementation, ensuring that all personnel and biochar producers are well-prepared for their roles.

Type of technology used to produce biochar

Flame curtain pyrolysis technology in steel-shield soil pits was used to produce biochar, as further described in Section 1.11. This technology choice, based on its efficiency and environmental benefits, will remain the standard method for biochar production in the project, ensuring consistency and reliability in biochar quality and production processes.

Description of Monitoring Tasks

As the majority of farmers are located in remote areas without access to smartphones, internet, or the ability to use a mobile app, field officers regularly inspected and reported data using the Project Reignite mobile app. The monitoring tasks carried out included sourcing, where biochar producers (farmers) sourced waste biomass from their own or neighbouring farms, and production, where field officers visited biochar producers to inspect and verify the biomass and biochar production. Application tasks involved field officers supervising the application of biochar to the soil and collecting relevant data points. This hands-on approach to monitoring tasks will continue to ensure accurate and timely data collection and reporting.

The field officers in the project use the Reignite monitoring app to record biochar production and application performed by biochar producers in the project. The field officers monitor each batch of biochar produced and collect data points in the process.

- Sourcing
    - Biochar producers (farmers) sourced waste biomass from their own/ family's/ neighbors' farms. Field officers interviewed the biochar producers at the beginning of each sourcing cycle (end of agricultural season) to identify the types and estimated amounts of waste biomass available at the production site.
- Production

- The field officers visited the biochar producer (farmer) for each batch produced. During the visit, the field officer measured and verified the biochar production physically and sealed the bags filled with the biochar produced. They entered the below information on the app:
  - Inspection ID (generated automatically, linked with the field officer's and biochar producer's ID)
  - Type of biomass used to produce biochar (it can only be 1 type for a batch)
  - Moisture content of biomass used to produce biochar
  - Temperature of biochar production taken using a hand-held infrared thermometer
  - Weight of biochar produced
  - Number of standardized bags of biochar
  - Date of biochar production

- Application
  - Once the biochar producer (farmer) was ready to apply the inspected biochar to the soil, the field officer visited the farm and opened the sealed bags. The sealed bags were opened only in the presence of the field officer inspecting the farm. For any bag whose seal was found broken, the field officer performed a second weighing and revised the total weight of the batch recorded on the app. The lower of the two weight readings was applied to determine the values of the mass parameter $M_{t,k,p,y}$ for the further calculations of carbon content $CC_{t,k,y}$ and project emissions $PE_{PS,p,y}$. They supervised the biochar producer during application to ensure all biochar produced has been applied to the soil. They collected the following data points after supervision of application:
    - Date of Application
    - GPS Coordinates of Application
    - Signature of the Biochar Producer
    - Signature of the Field Officer

Internal Auditing to Check Data Integrity and Monitoring (QA/QC Procedure):

Managers regularly conducted internal audits of biochar producers to validate the data submitted by field officers through the app. This multi-layered verification approach reviewed digital records and corroborated them with physical evidence, producer statements, and other forms of verification. Managers were responsible for confirming the proper implementation of all quality control and quality assurance measures. This ongoing process of internal auditing and quality control will continue to play a crucial role in ensuring the integrity and reliability of the project's data.

Maintenance and Data Storage of the Project System

Given the long-term nature of the project, data collection and archiving were crucial components. All field data, data analyses, models, calculations of carbon stocks, and copies of the monitoring reports were stored in a dedicated cloud database with a backup facility. This system for maintenance and data storage will remain a foundational aspect of the project, ensuring that all relevant information is securely stored and accessible for future analysis, reporting, and verification purposes.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

There are no changes in the computation of baseline emissions.

4.2 Project Emissions

There are no changes in the computation of project emissions.

4.3 Leakage Emissions

There are no changes in the computation of leakage emissions.

4.4 GHG Emission Reductions and Carbon Dioxide Removals

There are no changes in Carbon Dioxide Removals

Monitoring period	16-October-2023 to 30-June-2024					
Vintage period	Baseline emissions (tCO_2e)	Project emissions (tCO_2e)	Leakage emissions (tCO_2e)	Reduction VCUs (tCO_2e)	Removal VCUs (tCO_2e)	Total VCUs eligible for issuance (tCO_2e)
Year 2023 (16-10-2023- 31-12-2023)	0	39,909	0	0	39,909	39,909
Year 2024 (1-1-2024 – 30-6-2024)	0	75,194	0	0	75,194	75,194
Total	0	115,103	0	0	115,103	115,103

4.5 VCU Reconciliation Summary Table

There are no changes in the carbon dioxide removals.

Vintage period	Approved total VCUs eligible for issuance	New total VCUs eligible for issuance	Reconciliation percentage (%) = New VCUs/ original VCUs	Original total buffer pool allocation	New total buffer pool allocation	Buffer allocation difference (new total – old total)
Year 2023 (16-10-2023 - 31-12-2023)	*39,909*	*39,909*	*0%*	*0*	*0*	*0*
Year 2024 (1-1-2024 – 30-6-2024)	75,194	75,194	0%	0	0	0

APPENDIX 1: COMMERCIALLY SENSITIVE INFORMATION

There is no project related commercially sensitive information excluded from this document. The PD includes commercially sensitive information which has been excluded from the public version of the PD.