# REFORESTATION OF DEGRADED LAND BY MTPL IN INDIA

EKI Energy Services Limited

EnKing Embassy, Plot 48, Part II, Vijay Nagar, Indore, Madhya Pradesh, India - 452010

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| Project Title | Reforestation of Degraded Land by MTPL In India |
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# CONTENTS

# 1 PROJECT DETAILS

## 1.1 Summary Description of the Project

The proposed project activity by MTPL involves carbon sequestration of degraded lands through reforestation activities. Many discrete parcels of degraded land that is owned by small and poor farmers/ tribal who do not have the capability of plantation without any external financial support and technical guidance are reforested under Farm Forestry Scheme. The project encompasses 12, 437 parcels of land measuring 14,969.46 hectares owned by 12, 002 farmers distributed in seven districts across three states Odisha, Andhra Pradesh and Chhattisgarh, majority being in Odisha which constitutes almost 83% area of the project, 14% in Andhra Pradesh and only 3% in Chhattisgarh. The farmers participating in the reforestation activity are small and marginal farmers mostly owning small parcels of land. The land holding of almost 92% farmers is 5 acres or less, out of which 60% own land of area with 3 acres or less. Merely 8% farmers are holding more than 5 acres of land among which only 1% above 10 acres. The project has been undertaken to protect the land which was severely degraded or degrading. Prior to the project activity the lands were wastelands due to severe soil erosion without considerable flora. Besides increasing the forest cover the project activity would also provide enhanced sources of livelihood and income in rural areas by generating large employment opportunities. The reforestation under the proposed project activity is on degraded land which was lying barren since decades. The farmers who own the land are mainly poor farmers/tribal who do not have the capability of growing plantation of their own without any external financial support and technical guidance. They do not have capital to invest for plantation without any return for five years. In absence of the project activity the land would have continued as degraded land or degrading would continue further. Eucalyptus, a fast growing species has been planted in the project area of 14,969.46 hectares for carbon sequestration and carbon credit generation. Silviculture activities are being carried out such as raising nursery, site preparation, seedling transportation, planting, fencing and maintenance of plantation. The annual average GHG emission reduction from the project activity is 146,998 $tCO_2$ equivalent per annum for a crediting period 30 years.

## 1.2 Sectoral Scope and Project Type

Sectoral scope applicable to the project is Sectoral scope 14 which is 'Agriculture, Forestry and Other Land Uses' (AFOLU) under the category ‘Afforestation, Reforestation and Revegetation (ARR)’.

## 1.3 Project Eligibility

According to the list of eligible AFOLU Projects described in Appendix 1 of VCS Standard Version 4.0, the present project activity falls under the “Afforestation, Reforestation and Revegetation” (ARR) category. The project aims at increasing the vegetation cover through plantation. The justification of eligibility of the project under the scope of the VCS Program are given in the table below.

**Table 1**: Eligibility conditions for Afforestation, Reforestation and Revegetation (ARR) and description under VCS

| Eligibility conditions | Justification/Description |
|---|---|
| a) Eligible ARR activities are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing or restoring vegetative cover (forest or | According to the list of eligible AFOLU Projects described in Appendix 1 of VCS Standard Version 4.0, the present activity falls under the Afforestation, Reforestation and Revegetation (ARR) category. The project aims at increasing the forest cover through eucalyptus plantation which leads to carbon |

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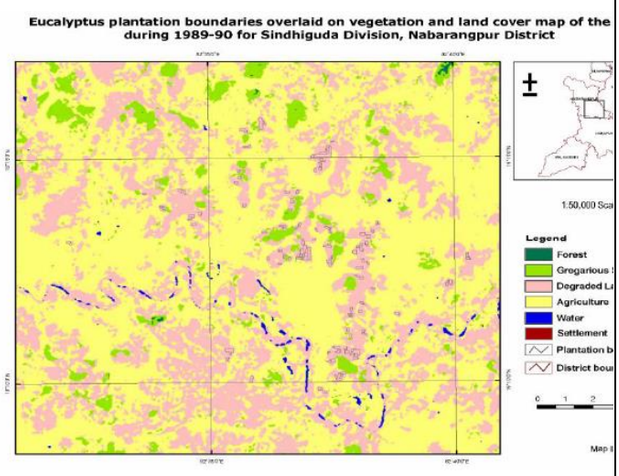
|---|---|---|
| | non-forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation. | sequestration in aboveground biomass, belowground biomass and soil organic carbon. |
| | b) Eligible ARR projects may include timber harvesting in their management plan. | The eucalyptus trees planted are harvested when they are 5 years old and onwards. It is part of the management plan which involves strata wise and year wise harvesting and replanting. |
| | c) The project area shall not be cleared of native ecosystems within the 10 year period prior to the project start date. | The project activity has not cleared any native ecosystem within the 10 year period prior to the project start date. This has been demonstrated through Satellite Imageries of 1989-90 period, Land title document, Baseline vegetation survey and interviews with the local farmers/communities on land use/cover history and important events during Participatory Rural Appraisal (PRA). The land that has been reforested under this ARR VCS project activity was barren due to heavy soil erosion and loss of top soil. Soil erosion caused reduction in the carbon stocks over time to the point where there is little vegetation and the soil has low organic carbon content. There was no woody vegetation found in 1989-1990 as the land was under severe soil erosion and hence satisfies the criteria of being non-forested since 31st December, 1989. The explanation of the past land use scenario are discussed below:<br><br>(a) Satellite imageries: The satellite imageries of 1989-90 period (Map overlay on Landsat TM data dated 19 Nov 1990 and classified image) indicated that the land taken up for present project activity neither contain any forest nor fall under the forest category as defined by the State of Forest Report (1999) Government of India. They fall under the category of degraded land. Land cover map in respect of Sindhiguda division is attached forthwith:<br><br>  <br><br>(b) Land title document: The farmers owning the land necessarily possess the title document of the land locally known as “Land Patta” in Odisha & Chhattisgarh and “Land Pass Book” in Andhra Pradesh issued by Land Revenue Department of respective State |

| | |
|---|---|
| | Governments wherein the land category is also mentioned. The land pattas of entire area under the project activity consideration clearly evidence that they were not forest land prior to the project start date. They are categorically mentioned as degraded land locally known as "*Donger* land" in Odisha, "*Parat* land" in Chhattisgarh and "*Mettu bhumi*" in Andhra Pradesh.<br><br>(c) Certificates from Local Tehsildars: Officials from local land revenue department of all the three states, the Tehsildars of the area have certified that the land category mentioned as Dongar, Parat, Mettu in patta/ passbook is nothing but degraded land.<br><br>(d) Baseline Vegetation Survey: A survey aiming to assess baseline vegetation was conducted by the team of MTPL field staff in the year 2001 before start of the project activity. The survey was conducted in different time periods, first post monsoon (October, 2000 to January, 2001) and thereafter pre monsoon in summer (May-June 2001). From the survey it was observed that there were very few trees growing in the project site, and the species *Anacardium occidentale* is the dominant tree species in the area. The field staff visited individual sites along with the concerned farmer and penned down the vegetation noticed on the site selected for forestation. The data was then compiled to evidence the eligibility of the land as well as to estimate the baseline carbon sequestration of the project activity.<br><br>It was observed from the vegetation report that the pre and post monsoon scenarios widely differed. In post monsoon period the land was flourished with grass, bushes and weeds but in summer everything vanished and the land was totally barren leaving no vegetation at all. It was further observed that the land is divided into two categories – land without vegetation and land with vegetation. The land with vegetation contained grasses, shrubs and a few trees like mango, cashew, teak, sal, jackfruit etc. The other category was totally barren having light scattered grass at the most. |

## 1.4 Project Design

The project has been designed to include a single installation of an activity and not as a multiple project activity or as a grouped project activity.

## 1.5 Project Proponent

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| **Organization name** | Mangalam Timber Products Limited |
| **Contact person** | P. S. Prasad |

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|---|---|
| Title | Mr. |
| Address | 9/1 R.N.Mukherjee Road, Birla Building, 7th Floor, Kolkata, West Bengal, India |
| Telephone | +91 9903941332 |
| Email | psprasad@mangalamtimber.com |

## 1.6 Other Entities Involved in the Project

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|---|---|
| Organization name | EK Energy Services Ltd. |
| Role in the project | Gap validation and verification process |
| Contact person | Manish Dabkara |
| Title | Mr. |
| Address | EnKing Embassy, Plot 48, Part II, Vijay Nagar, Indore, Madhya Pradesh 452010 |
| Telephone | +91- 731 428 9086 |
| Email | manish@enkingint.org, moonis@enkingint.org, registry@enkingint.org |

## 1.7 Ownership

Land Title (Land Patta) : The farmers necessarily possess the legal title of the land in the form of “Land Patta” in Odisha & Chhattisgarh and “Land Pass Book” in Andhra Pradesh issued by Land Revenue Department of respective State Governments. Nil Encumbrance Certificate (NEC) & No Dues Certificate (NDC) is further obtained from the respective land authorities to ensure that the land is free from any burden and that the title is clear. These are the base document required to process the loan by the bank. The patta/passbook is kept by the bank under their custody as security against the loan sanctioned by them till its recovery in each & every case.

Tripartite Agreement: When degraded land is confirmed from the patta and clear title is ensured by the bank for granting loan, an agreement is entered into by the farmer, the bank and company’s authorized representative wherein the obligations of all the three parties are clearly stated.

MTPL agrees to supply good quality of seedlings and fertilizers on competitive price to farmers and to provide technical, assistance and services relating to planting and maintenance of such plantation till they are harvested. The company agrees to buy back the harvested timber at prevailing market price or minimum rate mentioned in the agreement or at the rate fixed by Odisha Forest Development Corporation whichever is higher at the time of harvest.

The farmers agree to plantation on their degraded land, their upkeep for proper growth and protection from illegal felling. They also agree to deposit the title deed of the land with bank as security till the entire loan with accrued interest is paid back to the bank. For transparency all loan is disbursed to the farmers through SB account opened in their name at the branch.

Unless tripartite agreement is reached between three parties after fulfilling all the stipulated criteria, no loan is advanced and therefore no plantation proceeds. Hence tripartite agreement is also available in case of each & every farmer.

Carbon Contract: Reforestation under the project activity is on many small parcels of degraded land owned by poor farmers & tribal. It's not possible for them to claim carbon credit on their reforestation. In India there is no specific existing regulation on the rights to carbon credits. As such they individually.

Authorize MTPL to claim carbon credit on their behalf and the company agrees to share a part of carbon revenue with them. A letter "Authorization for Claiming Carbon Credits" is signed by all the participating farmers individually or mutually agreed terms & conditions reproduced hereunder:

1. Entire cost incurred on development, documentation, mapping, measurement, validation, verification and registration of the project will be borne by the company. The farmers will not be required to pay on this account. However any incidental expenses which may require additionally in future during the crediting period may be charged to the farmers with prior notice to them.

2. The farmers will get proportionate share in the CER revenue earned by the company on prorata basis in lieu of their plantation included in the project boundary. The company agrees to pay 12% of the CER revenue earned per acre to the farmers at present or as mutually agreed upon from time to time in future.

3. The sum due to the farmers under the will be paid normally through bank within three months of realization of CER revenue by the company for which they will be required to furnish a SB account in their name when asked for by the company. However mode of payment may change on the basis of mutual agreement.

4. The farmers will not be entitled for CER revenue in the event of failure of their plantation and /or opting out from the scheme and / or other plantation (s) which is not included in the project boundary.

5. The farmers will not claim for carbon credit for the plantations included in the subject project boundary through any other agency (ies) or organization (s).

## 1.8 Project Start Date

The start date of the project activity is 25-June-2001. The project proponent requested an exemption in 2011 under section 3.7.5 of the VCS Standard v3 to the VERRA, which permits the registration of projects with a start date before 1 January 2002.The date on which first tripartite agreement was executed between the farmer, the company and the bank to undertake project activity has been considered as the start date. The first tripartite agreement was executed in respect of Shri Chaitan Kendu (KBG001), village Kenduguda under Indian Overseas Bank, Boipariguda, district Koraput on 25-June-2001 which has been considered as start date of the project activity.

## 1.9 Project Crediting Period

The duration of the VCS project crediting period is 30 years and zero month, beginning on 25-June-2001 and ending on 24-June-2031. The project crediting period is fixed and non-renewable.

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

| **Project Scale** | |
|---|---|
| Project | x |
| Large project | |

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 2001-2002 | 3862 |
| 2002-2003 | 28664 |
| 2003-2004 | 97464 |
| 2004-2005 | 261221 |
| 2005-2006 | 618849 |
| 2006-2007 | 736067 |
| 2007-2008 | 1021436 |
| 2008-2009 | 1615971 |
| 2009-2010 | -385738 |
| 2010-2011 | 365795 |
| 2011-2012 | -153504 |
| 2012-2013 | -444379 |
| 2013-2014 | -246503 |
| 2014-2015 | 542842 |
| 2015-2016 | 119924 |
| 2016-2017 | -306763 |
| 2017-2018 | -246504 |
| 2018-2019 | 542841 |
| 2019-2020 | 119923 |
| 2020-2021 | -306764 |
| 2021-2022 | -247459 |
| 2022-2023 | 537882 |
| 2023-2024 | 96217 |
| 2024-2025 | -382038 |
| 2025-2026 | -437877 |
| 2026-2027 | 586101 |
| 2027-2028 | 6175 |
| 2028-2029 | -909107 |
| 2029-2030 | 1588523 |
| 2030-2031 | -413187 |
| **Total estimated ERs** | **4,409,933** |
| **Total number of crediting years** | **30 years** |
| **Average annual ERs** | **146,998** |

**Long-term average (LTA) Calculation**

The Long-Term Average (LTA) has been calculated by following the VCS Guidelines of Section 3.2.21 of VCS Program Standard v4.1[1] and AFOLU Guidance: Example for Calculating the Long Term Average Carbon Stock for ARR Projects with Harvesting[2]."

The present ARR project has been developed on the degraded lands. The project crediting period is 30 years. Trees are planted in different year wise strata at the staggered intervals. The project defines 7 year plantation programme. The harvesting of trees occurs on interval of 5-years in each strata. With harvesting, replanting take place after harvesting operations in the same year.

The entire land included in the project activity has been stratified into 7 project strata based on planting year as given in Table below.

**Table 3** Year wise project stratification

| Plantation year | Strata | Area (in hectares) |
|---|---|---|
| 2001 | Strata 1 | 520.58 |
| 2002 | Strata 2 | 1000.88 |
| 2003 | Strata 3 | 1201.34 |
| 2004 | Strata 4 | 2163.71 |
| 2005 | Strata 5 | 3023.61 |
| 2006 | Strata 6 | 3400.43 |
| 2007 | Strata 7 | 3658.91 |
| | **Total** | **14969.46 (hectares)** |

According to section 3.2.21 of the VCS Standard v4.1, the following steps have been followed as described in the following table.

**Table 4** Step wise description for estimating Long-Term Average (LTA)

| Step # | Step description | Explanation |
|---|---|---|
| Step #1 | 1) Establish the period over which the long-term average GHG benefit shall be calculated, noting the following:<br>a) For ARR or IFM projects undertaking even-aged management, the time period over which the long-term GHG benefit is calculated shall include at minimum one full harvest/cutting cycle, including the last harvest/cut in the cycle. For example, where a project crediting period is 40 years and has a harvest cycle of 12 years, the long-term average GHG benefit will be determined for a period of 48 years. | The crediting period of the project is 30 years. The stratification of emission reduction and LTA estimation has been done year-wise plantation. Trees are planted in different year wise strata at the staggered intervals. The project defines 7 year plantation programme for each strata. The harvesting of trees occurs on interval of 5-years in each strata. With harvesting, replanting take place after harvesting operations in the same year. So, in each strata developed for the project activity, the crediting period (which is 30 years) will cover more than two harvest/cycle cycles (including the last harvest/cut cycle) and maximum six harvest cycles (followed by replanting). |
| | b) For ARR projects under conservation easements with no intention to harvest after the project crediting period, or for selectively-cut IFM projects, the time period over which the long-term average is calculated shall be the length of the project crediting period." The project proponent is required to follow the | This ARR project is not under conservation easement or selectively-cut IFM projects. Therefore it is not applicable. |

[1] https://verra.org/wp-content/uploads/2021/04/VCS-Standard_v4.1.pdf

[2] https://verra.org/wp-content/uploads/2018/03/VCS-Guidance-Harvesting-Examples_0.pdf

| | | |
|---|---|---|
| | above mentioned procedure to calculate the long-term average. | |
| Step #2 | Determine the expected total GHG benefit of the project for each year of the established time period. For each year, the total GHG benefit is the to-date GHG emission reductions or removals from the project scenario minus baseline scenario. | The expected total GHG benefit of the project for each year of the established time period has been calculated and described in the ER spreadsheet and also described in the LTA calculation table below. |
| Step #3 | Sum the total GHG benefit of each year over the established time period | The sum of total GHG benefit year over the established time period is 992,110,923.3 $tCO_2e$. |
| Step #4 | Calculate the average GHG benefit of the project over the established time period. | The average GHG benefit of the established time period (which is 30 years) is 3,307,036.4 $tCO_2e$ |

Long Term Average The Long Term Average (LTA) has been calculated following the VCS Standard Guidelines included in the Program Standard v4.1 Section 3.2.21[3], and VCS Guidance Document "AFOLU Guidance: Example for Calculating the Long Term Average Carbon Stock for ARR Projects with Harvesting[4]."

The following equation to calculate the long-term average GHG benefit:

$$LA = \frac{\sum_{t=0}^{n} PE_t - BE_t}{n}$$

Where:

| | |
|---|---|
| LA | The long-term average GHG benefit |
| PEt | The total to-date GHG emission reductions and removals generated in the project scenario ($tCO_2e$), inclusive of $CO_2$, $N_2O$, $CH_4$ and leakage as applicable |
| BEt | The total to-date GHG emission reductions and removals projected for the baseline scenario ($tCO_2e$) t Year n Total number of years in the establishment period, which is 30 |
| t | Year |
| n | Total number of years in the establishment period, which is 30 |

So, according to the calculation from Table 5:

$\sum_{t=0}^{n} PE_t - BE_t$ ; Expected GHG benefit-to-date = 99,211,092.3 $tCO_2e$

n ; Total number of years in he establishment period = 30

= 99,211,092.3 / 30

= 3,307,036.4 $tCO_2e$

So, the long-term average GHG benefit from the project is 3,307,036.4 $tCO_2e$

[3] https://verra.org/wp-content/uploads/2021/04/VCS-Standard_v4.1.pdf

[4] https://verra.org/wp-content/uploads/2018/03/VCS-Guidance-Harvesting-Examples_0.pdf

Visual representation of Long Term Average benefit under strata wise harvesting and replanting

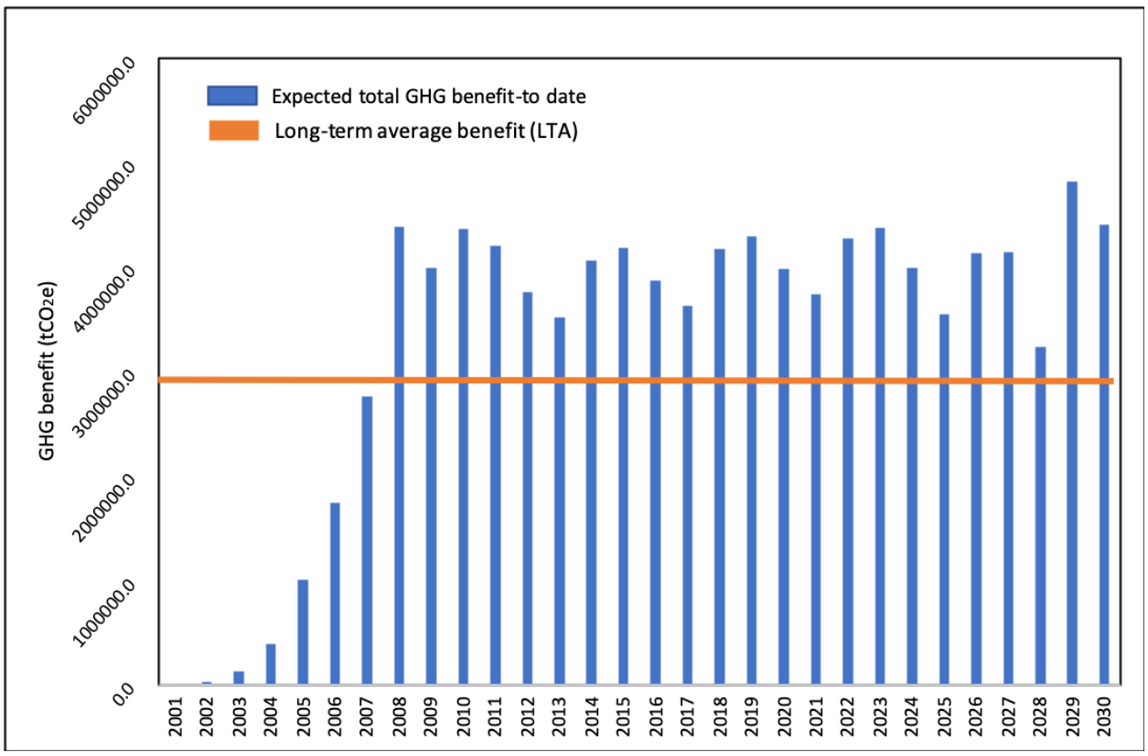

**Table 5** The estimation of average GHG benefit to date (LTA) is described in the table below:

| Year<br><br>t | Baseline scenario : to-date GHG emission reductions and removals at year t | Strata 1 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 2 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 3 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 4 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 5 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 6 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Strata 7 - to-date GHG emission reductions and removals at year t<br><br>(tCO2e) | Total to-date GHG emission reductions and removals from trees at year t<br><br>(tCO2e) | Annual GHG emission reductions or removals from Soil Organic Carbon<br><br>(tCO2e/year) | To-date GHG emission reductions or removals from Soil Organic Carbon<br><br>(tCO2e) | Total to-date GHG emissions reductions or removals (from trees and Soil Organic Carbon)<br><br>(tCO2e) | Annual change in GHG benefit<br><br>(tCO2e) | Expected Total GHG benefit to-date<br><br>(tCO2e) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BE | PE 1 | PE 2 | PE 3 | PE 4 | PE 5 | PE 6 | PE 7 | PE (trees) | PE t (Soil Organic Carbon) | PE (Soil Organic Carbon) | PE | PE t - PE t-1 | PE t - BE t |
| 2001 | 0.0 | 2907.97 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2908.0 | 954 | 954.40 | 3862.4 | 0.0 | 3862.4 |
| 2002 | 2.9 | 23194.73 | 5590.93 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 28785.7 | 2789 | 3743.74 | 32529.4 | 28667.0 | 32526.5 |
| 2003 | 7.7 | 69959.78 | 44594.77 | 6710.70 | 0.00 | 0.00 | 0.00 | 0.00 | 121265.2 | 4992 | 8735.54 | 130000.8 | 97471.4 | 129993.1 |
| 2004 | 14.1 | 160305.65 | 134506.40 | 53526.29 | 25202.96 | 0.00 | 0.00 | 0.00 | 373541.3 | 8959 | 17694.13 | 391235.4 | 261234.7 | 391221.3 |
| 2005 | 24.5 | 290344.43 | 308207.61 | 161445.58 | 201025.51 | 16889.94 | 0.00 | 0.00 | 977913.1 | 14502 | 32196.02 | 1010109.1 | 618873.7 | 1010084.5 |
| 2006 | 36.3 | 5076.25 | 558223.39 | 369935.97 | 606331.58 | 134718.65 | 18994.86 | 0.00 | 1693280.7 | 20736 | 52932.02 | 1746212.7 | 736103.6 | 1746176.4 |
| 2007 | 50.6 | 39907.55 | 9759.72 | 670025.35 | 1389346.54 | 406337.33 | 151508.07 | 20438.74 | 2687323.3 | 27444 | 80376.03 | 2767699.3 | 1021486.6 | 2767648.7 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2008 | 67.8 | 120019.77 | 76727.25 | 11714.42 | 2516374.40 | 931080.26 | 456977.47 | 163024.79 | 4275918.4 | 27444 | 107820.03 | 4383738.4 | 1616039.1 | 4383670.6 |
| 2009 | 68.0 | 270764.79 | 230752.97 | 92094.31 | 43995.14 | 1686365.84 | 1047116.94 | 491714.12 | 3862804.1 | 27444 | -135264.04 | 3998068.2 | -385670.2 | 3998000.1 |
| 2010 | 68.2 | 5076.25 | 520579.09 | 276968.58 | 345873.14 | 29483.65 | 1896530.63 | 1126712.40 | 4201223.7 | 27444 | 162708.05 | 4363931.8 | 365863.6 | 4363863.6 |
| 2011 | 68.4 | 39907.55 | 9759.72 | 624841.58 | 1040194.45 | 231789.30 | 33158.07 | 2040693.35 | 4020344.0 | 27444 | -190152.05 | 4210496.1 | -153435.7 | 4210427.6 |
| 2012 | 68.7 | 120019.77 | 76727.25 | 11714.42 | 2346680.39 | 697093.56 | 260676.24 | 35678.55 | 3548590.2 | 27444 | -217596.06 | 3766186.2 | -444309.9 | 3766117.5 |
| 2013 | 68.9 | 270764.79 | 230752.97 | 92094.31 | 43995.14 | 1572644.21 | 783969.44 | 280491.26 | 3274712.1 | 27444 | -245040.07 | 3519752.2 | -246434.0 | 3519683.3 |
| 2014 | 69.1 | 5076.25 | 520579.09 | 276968.58 | 345873.14 | 29483.65 | 1768636.35 | 843562.03 | 3790179.1 | 27444 | -272484.07 | 4062663.2 | 542911.0 | 4062594.1 |
| 2015 | 69.3 | 39907.55 | 9759.72 | 624841.58 | 1040194.45 | 231789.30 | 33158.07 | 1903077.32 | 3882728.0 | 27444 | -299928.08 | 4182656.1 | 119992.9 | 4182586.7 |
| 2016 | 69.5 | 120019.77 | 76727.25 | 11714.42 | 2346680.39 | 697093.56 | 260676.24 | 35678.55 | 3548590.2 | 27444 | -327372.09 | 3875962.2 | -306693.8 | 3875892.7 |
| 2017 | 69.8 | 270764.79 | 230752.97 | 92094.31 | 43995.14 | 1572644.21 | 783969.44 | 280491.26 | 3274712.1 | 27444 | -354816.09 | 3629528.2 | -246434.0 | 3629458.4 |
| 2018 | 70.0 | 5076.25 | 520579.09 | 276968.58 | 345873.14 | 29483.65 | 1768636.35 | 843562.03 | 3790179.1 | 27444 | -382260.10 | 4172439.2 | 542911.0 | 4172369.2 |
| 2019 | 70.2 | 39907.55 | 9759.72 | 624841.58 | 1040194.45 | 231789.30 | 33158.07 | 1903077.32 | 3882728.0 | 27444 | -409704.10 | 4292432.1 | 119992.9 | 4292361.9 |
| 2020 | 70.4 | 120019.77 | 76727.25 | 11714.42 | 2346680.39 | 697093.56 | 260676.24 | 35678.55 | 3548590.2 | 27444 | -437148.11 | 3985738.3 | -306693.8 | 3985667.8 |
| 2021 | 70.7 | 270764.79 | 230752.97 | 92094.31 | 43995.14 | 1572644.21 | 783969.44 | 280491.26 | 3274712.1 | 26490 | -463637.72 | 3738349.8 | -247388.4 | 3738279.2 |
| 2022 | 70.9 | 2907.97 | 520579.09 | 276968.58 | 345873.14 | 29483.65 | 1768636.35 | 843562.03 | 3788010.8 | 24655 | -488292.38 | 4276303.2 | 537953.3 | 4276232.3 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2023 | 71.1 | 23194.73 | 5590.93 | 624841.58 | 1040194.45 | 231789.30 | 33158.07 | 1903077.32 | 3861846.4 | 22452 | 510744.59 | 4372591.0 | 96287.8 | 4372519.9 |
| 2024 | 71.3 | 69959.78 | 44594.77 | 6710.70 | 2346680.39 | 697093.56 | 260676.24 | 35678.55 | 3461394.0 | 18485 | 529230.00 | 3990624.0 | -381967.0 | 3990552.7 |
| 2025 | 71.5 | 160305.65 | 134506.40 | 53526.29 | 25202.96 | 1572644.21 | 783969.44 | 280491.26 | 3010646.2 | 12942 | 542172.13 | 3552818.3 | -437805.6 | 3552746.8 |
| 2026 | 71.8 | 290344.43 | 308207.61 | 161445.58 | 201025.51 | 16889.94 | 1768636.35 | 843562.03 | 3590111.5 | 6708 | 548880.13 | 4138991.6 | 586173.2 | 4138919.8 |
| 2027 | 72.0 | 5076.25 | 558223.39 | 369935.97 | 606331.58 | 134718.65 | 18994.86 | 1903077.32 | 3596358.0 | 0 | 548880.13 | 4145238.2 | 6246.6 | 4145166.2 |
| 2028 | 72.2 | 39907.55 | 9759.72 | 670025.35 | 1389346.54 | 406337.33 | 151508.07 | 20438.74 | 2687323.3 | 0 | 548880.13 | 3236203.4 | -909034.7 | 3236131.2 |
| 2029 | 72.4 | 120019.77 | 76727.25 | 11714.42 | 2516374.40 | 931080.26 | 456977.47 | 163024.79 | 4275918.4 | 0 | 548880.13 | 4824798.5 | 1588595.0 | 4824726.1 |
| 2030 | 72.7 | 270764.79 | 230752.97 | 92094.31 | 43995.14 | 1686365.84 | 1047116.94 | 491714.12 | 3862804.1 | 0 | 548880.13 | 4411684.2 | -413114.2 | 4411611.6 |
| | | | | | | | | | | | | | **SUM** | **99211092.3** |
| | | | | | | | | | | | | | **LTA** | **3307036.4** |

## 1.11 Description of the Project Activity



The proposed ARR project activity by MTPL is under development in the VCS Program. It involves carbon sequestration on degraded lands through reforestation activities. Many discrete parcels of degraded land that is owned by the small and poor farmers/ tribal who do not have the capability of plantation without any external financial support and technical guidance are reforested under Farm Forestry Scheme. The project encompasses 12437 parcels of land measuring 14969.46 hectares owned by the farmers distributed in seven districts across three states of India – Odisha (earlier name –Orissa), Andhra Pradesh and Chhattisgarh. Majority of the project area is in Odisha which constitutes almost 83% area of the project, 14% is in Andhra Pradesh and only 3% is in Chhattisgarh. The farmers participating in the reforestation activity are small and marginal farmers mostly owning small parcels of land. The land holding of almost 92% farmers is 5 acres or less out of which 60% own land 3 acres or less. Around 8% farmers are holding more than 5 acres of land among which only 1% above 10 acres. The project is not located within a jurisdiction covered by a jurisdiction REDD+ program.

**Measures carried out for the involvement of various participating entities**

For participation, the farmers were encouraged for eucalyptus plantation on their degraded land which would have been otherwise lying barren long without any economic return. The representatives of project held meetings with the land owners in different villages explaining reforestation scheme and making them aware of the benefits of the scheme. Under the scheme the banks provide financial capital by way of loan as approved by NABARD (National Bank for Agriculture and Rural Development), company provided seedlings and planting materials, fertilizers and technical assistance for plantation and the farmers invested on their land for reforestation.

A tripartite agreement was made between the farmers, bank and the company on mutually agreed terms wherein the obligations of all the three parties were clearly stated. MTPL, the project developer agreed to supply good quality of planting materials, seedlings and fertilizers on competitive price to the farmers. The company ensured free replacement of moratorium. The company agreed to provide technical assistance and services relating to planting and maintenance of the tree plantation. The company also agreed to assist the farmers to obtain no objection certificate for plantation, felling, cutting and billeting of trees and transportation of timber from farmers site to the factory of the company from competent authority of the forest department as and when required. The company agreed to buy back the harvested timber at prevailing market price or minimum rate mentioned in the agreement or at the rate fixed by Odisha Forest Development Corporation (OFDC) whichever is higher during the time of harvest. The farmers agreed to plantation on their degraded land, their upkeep for proper growth and protection form illegal felling. They also agreed to deposit the title deed of the land with bank as security till the entire loan with accrued interest is paid back. For transparency, the loan was disbursed to the farmers through Savings Bank account opened in their name at respective branch of financing banks.

**Measures carried out for plantation and management activities**

The species selected for the project activity is Eucalyptus (*E. tereticornis*). The species belong to family *Myrtaceae* of *Angiospermae*. This hybrid tree species manifests good hybrid vigor for growth and volume production. It was selected due to its coppicing and drought resistant quality. The species has far greater rooting depth of 3 meters and offers greater capillary action and therefore can survive under water-stressed condition. Eucalyptus known their adaptability to grow quickly in a wide range of edapho-climatic conditions. They are fire hardy, produce relatively large volumes of wood, multipurpose benefits, have coppicing power and are resistant to being browsed by the cattle. Eucalyptus uses up water more effectively than any other perennial crop. It produces maximum biomass compared to local species per unit of water consumed.

The technical details for reforestation activity are as following:

**Nursery Technique:** Seeds of Eucalyptus are first treated with broad based fungicide and equal amount of fine quality sand for sowing. Such treated seeds are sown on nursery mother beds of size 10 m long & 1 m wide. Beds are covered with paddy straw to protect the seeds from the wind and rain besides encouraging better germination because rice straw provides optimum micro-environmental condition for the germinating seeds. Seedlings of 2-5 leaf stage are transplanted into polythene bags filled with soil, sand and well decomposed farm yard manure in the ratio of 2:1:1. Transplanted seedlings are provided with partial shade and sufficient water so that within 10 days most of the seedlings get acclimatized and begin to grow in polythene bags. Seedlings of 30-45 cm are obtained within 3 to 5 months of timeframe. Insecticides/pesticides are used only in case of pest infection.

**Site Preparation:** Plantation rows are aligned and pits are dug at a spacing of 3 m × 1.5 m with an aim to accommodate about 1000 plants per acre. Small pits (40-45 cm in diameter and 30-35 cm in depth) are dug manually for tree planting.

**Planting Techniques:** The plant of 30-45 cm (excluding container height) with girth of 1-2 cm at collar region is used for planting. The plants with container are dipped in bucket of water mixed with termiticides / insecticides just before planting. This helps in keeping better moisture within the ball of earth and keeps the insects/termites away. The plant are held in one hand and the polythene bag is cut with sharp knife/blade and completely removed in such a way that the plant roots are intact in ball of soil. The sapling is planted in such a way that the root collar region is well within the soil, as it is softest portion should not be exposed to sunlight. After planting soil around the plant is thoroughly compacted and is preferably done by using both feet without causing injury to plant.

**Plantation management:** The plantations are protected from grazing/browsing animals by means of live fencing. Termites are the major insects that cause severe damage to growing plants but is controlled by using Chlorpyriphos 20% EC. The application of Chlorpyriphos 20% EC was occasional and kept at minimal level and applied only when termites invaded the growing trees. Many factors play in combination to affect the leaching behaviour of insecticides into the ground water. Some of these factors are adsorption capacity of pesticides on the soil particles, water solubility of pesticides, pH and soil texture

(Crisanto et al., 1994)[5]. This group of insecticides have low water solubility and easily hydrolysed to its primary metabolite TCP which is moderately mobile. Under the saturated moisture condition, Chlorpyriphos have low mobility and therefore may not contaminate the groundwater[6]. According to Rani, et al. (2014)[7], the leachate fraction of soil did not contain any residues of Chlorpyriphos in both high (50 µg) as well as low doses (25 µg). Hence, the insecticides are safe for groundwater. Also in case of soils, this insecticide is not persistent for long. In another study, the residue of Chlorpyriphos degraded quickly upon application as no residue was detected on day 7 and day 14 since the application (Muhamad et al., 2010)[8]. In the top soil itself, the degradation rate is faster because of high soil microbial population (Ismail et al., 2002)[9]. Timely weeding and soil-working is done to boost-up the plant growth.

## 1.12 Project Location

The project site is distributed over three states of I – Odisha, Andhra Pradesh and Chhattisgarh. The project location and set of geodetic coordinates are submitted as a separate KML file. The northern part of the Odisha state lies on the edge of the great Indo-Gangetic plain. The Chhota Nagpur plateau occupies the western and northern portions of the state. Andhra Pradesh is surrounded by Madhya Pradesh and Odisha in the north, the Bay of Bengal in the east, Tamilnadu and Karnataka in the south and Maharashtra in the west. Chhattisgarh borders Madhya Pradesh on the northwest, Maharashtra on the west, Andhra Pradesh on the south, Odisha on the east, Jharkhand on the northeast and Uttar Pradesh on the north.

[5] Crisanto, T., Sanchez-Martin, M. J., Sanchez-Camazano, M., & Arienzo, M. (1994). Mobility of pesticides in soils. Influence of soil properties and pesticide structure. *Toxicological & Environmental Chemistry*, *45*(1-2), 97-104.

[6] Rani, M., Saini, S., & Kumari, B. (2014). Leaching behaviour of chlorpyriphos and cypermethrin in sandy loam soil. *Environmental monitoring and assessment*, *186*(1), 175-182.

[7] Rani, M., Saini, S., & Kumari, B. (2014). Leaching behaviour of chlorpyriphos and cypermethrin in sandy loam soil. *Environmental monitoring and assessment*, *186*(1), 175-182.

[8] Muhamad, H., Ai, T. Y., Sahid, I., & Mat, N. A. S. H. R. I. Y. A. H. (2010). Downward movement of chlorpyrifos in the soil of an oil palm plantation in Sepang, Selangor, Malaysia. *Journal of Oil Palm Research*, *22*(1), 721-728.

[9] Ismail, B. S., Enoma, A. O. S., Cheah, U. B., Lum, K. Y., & Malik, Z. (2002). Adsorption, desorption, and mobility of two insecticides in Malaysian agricultural soils. *Journal of Environmental Science and Health, Part B*, *37*(4), 355-364.


## 1.13 Conditions Prior to Project Initiation

Prior to the project initiation the lands under the project boundary were degraded lands without considerable vegetation due to severe soil erosion which led to loss of topsoil. However, pre and post monsoon scenario were different. In the post monsoon period, the lands were covered with grasses, bushes and weeds. but in summertime everything vanished and the land was completely barren. There were few trees like mango, jackfruit, sal, etc. scattered sparsely in the project boundary. They were not removed or harvested for the sake of implementing this project. The tree species present prior to project initiation were accounted for baseline emission reduction.

CLIMATE

Odisha - There are three major seasons - summer (March-June), Rainy Season (July-September) and the winter (October-February). Odisha lying just South of the Tropic of Cancer, has a tropical climate. It is warm almost throughout the year in the Western districts of Sundergarh, Sambalpur, Baragarh, Bolangir, Kalahandi and Mayurbhanj with maximum temperature hovering between 40-46 $^0$C and in winter, it is intolerably cool. In the coastal districts, the climate is equable but highly humid and sticky. The summer maximum temperature ranges between 35$^0$C - 40$^0$C and the low temperatures are usually between 12 -14$^0$C. Winter is not very severe except in some areas in Koraput and Phulbani where minimum temperature may drop to 3$^0$C - 4$^0$C. The average rainfall is 150 cm, experienced as the result of south west monsoon during July-September. The state also experiences small rainfall from the retreating monsoon in the months of October-November.

Andhra Pradesh - The average maximum temperature in most parts of Andhra Pradesh varies from 23 $^0$C - 28 $^0$C. Minimum temperature varies from 10 $^0$C – 12 $^0$C. Summers are hot and humid on the coastal plains and some places it touches above 42 $^0$C. The state of Andhra Pradesh experiences a very hot summer. Andhra Pradesh climate is marked by the onset of monsoons in second week of June which continues till September. This rainfall is caused by south west monsoon wind.

The state's coast receives heavy rain from northeast monsoon winds or the retreating monsoon winds also in October-November. Sometimes it is associated with cyclones as well. Climate in Andhra Pradesh is characterized by mild winter, temperature doesn't fall generally below 16 $^0$C

Chhatisgarh - Its positioning on the Tropic of Cancer makes the Chhattisgarh climate warm. As is usual with the tropical climate, the summers in Chhattisgarh are warm & humid and the winters are cool. During a typically hot summer day, the mercury can shoot up to 45 $^0$C. The climate in Chhattisgarh shows a major shift from the sultry heat to the pleasantly cold during the winters. The winters can be chilly with the mercury plummeting to hit the 10 $^0$C mark. The average rainfall is around 1400 mm.

TOPOGRAPHY

Koraput: Highland plateau and hill ranges of Eastern Ghats are the major topographical features of Koraput. Koraput is mainly consist of highly rugged mountain with narrow intermontane valleys, gently undulating with isolated hillocks and mounds in the west.

Nabarangpur: Nabarangpur comes under East Coast Plains and Hills agro-climatic zone. Undulating plains with scattered residual hills is the main topography of Nabarangpur.

Malkangiri: The topographical features of Malkangiri includes hills, intermontane valleys, Pediment - Inselberg complex and Bazada. The South Eastern Ghat occupies almost all the area of Malkangiri.

Vishakhapatnam: Vishakhapatnma is a basin like topography which is bounded by Kailasa, Yarada and Narava Hill ranges on north, south and west respectively and east by Bay of Bengal. It has undulating topography with a height of 4 to 50 m above mean sea level.

Vizianagram: It two different topographical features i.e., plain and hilly regions. The plains region is the part of North Coastal Plains of Andhra Pradesh whereas hill region consists of individual hills with undulating topography.

Srikakulam: Srikakulam is lined by Eastern Ghats from North East whereas Bay of Bengal lies in its east. Plains are dominated in coastal area whereas undulating lands with individual hills form rest of the district.

HYDROLOGY

Andhra Pradesh: Krishna and Godavari are the major river systems in the State. Godavari is the biggest in terms of length and breadth among the rivers of South India. Tungabhadra is an important tributary of the Krishna. Other important rivers are the Pennar, Vamsadhara and Nagavali. All these rivers are rainfed, and are of great economic significance because of their hydel power and irrigation potential.

Odisha: The northern part of the Odisha state lies on the edge of the great Indo-Gangetic plain. The Rihand River, a tributary of the Ganges, drains this area. The eastern end of the Satpura Range and the western edge of the Chota Nagpur Plateau form an east-west belt of hills that divide the Mahanadi River basin from the Indo-Gangetic plain. The central part of the state lies in the fertile plain of the Mahanadi and its tributaries, with extensive rice cultivation. The southern part of the state lies on the Deccan plateau, in the watershed of the Godavari River and its tributary the Indravati River. Other main rivers are Hasdo (a tributary of Mahanadi), Rihand, Indravati, Jonk and Arpa.

There are four groups of rivers which flow through Odisha into the Bay of Bengal. They are: (i) Rivers that have a source outside the State (the Subarnarekha, the Brahmani & the Mahanadi). (ii) Rivers having a source inside the State (the Budhabalanga, the Baitarini, the Salandi, & the Rushikulya). (iii) Rivers having a source inside the Odisha, but flow through other states (the Bahudu, the Vansadhara & the Nagavali). (iv) Rivers having a sourc inside Odisha, but tributary to rivers which flow through other states (the Machkund, the Sileru, the Kolab & the Indravati).

River Mahandi - It is the major river of Odisha and the sixth largest river in India. It originates from the Amarkantak hills of the Bastar Plateau in Raipur district of Madhya Pradesh. It is about 857 km long (494 kms. in Odisha) and its catchment area spreads over 141,600 sq. kms (65,580 sq. kms) in Odisha).

The Brahmani - It is the second largest river in Odisha. It flows through the Easter Ghats in Sundargarh, Kendujhar, Dhenkanal, Cuttack and Jajpur districts into the Coastal Plains and enters into the Bay of Bengal along with a combined mouth with the Mahanadi known as the Dhamra. The Brahmani is 799 kms. long (541 kms. in Odisha) and its catchment area spreads over 39,033 sq.kms. in Odisha).

The Baitarani - It originates from the Gonasika hills of the Keonjhar districts. It is 365 kms long and its catchment area spread over 12,790 sq. kms . It enters into the Bay of Bengal after joining of the Brahmani at Dharma mouth near Chandabali Subarnrekha.

The Subarnarekha - It orginates from the Chhotnagpur plateau of Bihar. It is 433 kms long (70 kms in Odisha) and has a catchment area of 19,500 sq. kms (3,200 sq. kms in Odisha).

The Budhabalanga - It orginates from the easterns slopes of the Similipala massif. It is about 175 kms long having a total catchment area of 4840 sq. kms. It is major tributaries are the Sone, the Gangadhar, the Catra etc.

The Rushikulya - It originates from the Rushyamala hills of the Eastern Ghats in Phulbani district. It is 165 kms long with 8900 sq. kms of catchment areas. Its tributaries are the Baghua the Dhanei Badanadi etc.

The Bahuda - It originates from the Ramgiri hills of the Eastern Ghats and joins the Bay of Bengal in Andhra Pradesh. It is 73 km long with a catchment area of 1250 sq. kms.

The Bansadhara - It originates from the Flanks of the Durgakangar hills (Lingaraj hills) of the Eastern Ghats in Kalahandi districts. It is 230 kms long (150 kms in Odisha). It enters in to the Bay of Bengal at Kalingapatnam in Andhra Pradesh. It has a catchment area of 11500 sq. kms.

The Nagabali - It originates from the Bijipur Hills of the Eastern Ghat near Lanji garah. It is 210 kms long (100 kms is in Odisha). It has a total catchment area of about 9410 sq. kms.

The Salandi - It originates from the Meghasani Hills of the Similipal massif in Keonjhar district. It is 144 kms long with catchment areas of 1793 sq. kms. The Indirabati - It originates from the Eastern Ghats in Kalahandi districts. It is 530 kms long with a catchment area of 41700 sq. kms as a tributary it flows into the Godabari River.

The Kolab - It originates from the Sinkaran hills of the Eastern Ghats in Koraput districts. It has catchment areas of 20400 sq. kms.

Springs - There are a number of mountain springs and hot spring in Odisha. The Badaghagara & Sanaghagara in Keonjhar districts, Satpasajya in Denkanal districts, the Chandikhole in Cuttack districts, the Barunei in Khorda districts, the Narayani & Nirmalajhar in Ganjam & Puri districts, the Patalaganga in Kalahandi districts, the Nursinghanath in Sambalpur districts and the Harisankar in Bolangir districts are some of the important mountain springs in Odisha.

Waterfalls - The Barehipani & Joranda (Similipal) in Mayurbhanja district, Sanaghagara & Badaghagara in Keonjhar district, Padhanpuri in Deogarh district, Khandadhar (Banei) in Sundargarh district, Phurlijharan, Khandabaladhar & Rabandhara in Kalahandi district, Kentamari & Putudi in Boudh & Phulbani districts, Dum Duma in Malkangiri district and Bogra in Koraput district are some of the major waterfalls of Odisha.

Lakes - The Chillika Lake is blackish water lagoon located in the southern part of the Odisha coastal plain. Its area varies from 780 sq. kms to 144 sq. kms from winter to monsoon seasons. Ansupa, Sara and Kanjia are some sweet water lakes of Odisha.

Chhattisgarh: 57.48% collection of water is done by Mahanadi & other rivers like Shivnath, Hasdo, Mand, Pary, Jonk, Kelo, Udanti, Sukha etc. in Chhattisgarh. Its second largest river is Godavari. Rihand is the main river in northern side of Chhattisgarh. The Chitrakoot Waterfalls in Jagdalpur in Chhattisgarh are often termed the Niagra of India. Kendai, Tatapani, Ruksganda, Amritdhara, Kothali, Gangrail Jalashaya, Kharkhara Bandh, Keshkal Teerathgarh waterfall are major waterfalls in Chhattisgarh.

SOIL

The project area has three soil types namely red soil, red & black and red loamy soil. In Odisha, the project area has Red soil and Red & Black soil. In Chattisgarh, the project area has combination of Red Loamy soil, Red & Black and Red soil. In Andhra Pradesh, the soil types are Red Loamy soil, Red & Black and Red soil.

Soil of Nabarangpur District : Major portion of the district is covered by lateritic soil followed by red and black cotton soil.

Soil of Malkangiri District: black soil occurs mainly in Malkangiri district. Sandy and clay type soil predominate the entire district. The soil is generally acidic in nature and alkaline in some patches. The salinity of the soil is normal. The percolated composition of it gives less binding capacity.

Soil of Koraput District : The soil of the district is mostly red, mixed red and yellow, alluvial and red and black. The texture is sandy loam to sandy clay loam. As per soil test the soils are acidic and poor in fertility status.

Soil of Vizianagaram District: The main soils in the Vizianagaram district are Red soils, Sandy loams and Sandy clay and they constitute 96 % of the total area. The soils in the district are predominantly loamy with medium fertility. There are mostly red loamy soils, as far as dry lands are concerned and clay loamy in case of wet lands.

Soil of Vishakapatnam District: Red Loamy soils predominate with a coverage of 69.9% of the villages of the district. The Soils are poor textured and easily drained. Sandy loamy soils come next with 19.2% villages coverage. 45% of the soils in the district are low in organic content and 55% in Phosphorous content.

Soil of Bastar District : Generally Sandy loamy, Red and Lateritic soil is prevalent in Bastar district. The soil throughout the greater portion of Bastar consists of light clay with an admixture of sand. The texture of the soil varies from sandy to fine textured clayey soils. The primary laterites are found as a cap on the top of the trap and gneissic rocks. Secondary laterites are usually found in the valleys and lowlying places. These soils are of fine texture and darker hues and are rich in humus.

ECOSYSTEM AND SPECIES

Project areas in all seven districts are dominated by degraded land. Because of degraded nature of land, majority of parcels are barren. A detailed ecological survey was conducted in the year 2000 - 2001 in the area in order to understand different floral and faunal composition of the existing ecosystem. The report contains the details of type & no of trees found in individual parcels of the project area along with herbs & shrubs contained in them. Very few areas are composed of tree vegetation. In all, 1557 parcels have been found with tree vegetation. Varity of trees found in the area are *Mangifera indica, Tectona grandis, Anacardium occidentale, Shorea robusta, Madhuca longifolia, Schleichera oleosa, Artocarpus heterophyllus* etc. In most of the areas during rainy season bushes, grasses grown but at the onset of summer everything

vanishes. Shrubs and under shrubs like *Cassia tora, Ipomea biloba, Achyranthes aspera* etc. are found in the project area. Cassia tora is a common plant of wasteland and tolerates low moisture content in the soil. This plant grows tall under conducive conditions. However, the plant found at the project site shows stunted growth proving the lowered fertility of the soil. *Capparis aphylla* grows well in nutrient poor sharply drained gravely soils. This shrub is found in abundance in the area.

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

There are no laws or regulations or policies that are specifically applicable to the reforestation activities in India. There are multiple laws, regulations and schemes for forest management and conservation. However, these are no legal obligations for these laws, regulations and schemes. Some of the acts and rules are as following which may be applicable for forest management but do not require any obligations for reforestation of lands in India. These are described in the table below:

**Table 6** Acts and rules

| Acts and Rules | Description |
|---|---|
| Water (Prevention and Control of Pollution) Act, 1974 with Rules. | The tree plantation activities pollute any water resources, whether surface or ground water. |
| Biological Diversity Act, 2002 | There is no mention of reforestation in the context of biodiversity |
| The Indian Forest Act (1927) | The The reforestation activity do not come under purview of The Indian Forest Act (1972). |
| Forest (Conservation) Act, 1980 | The reforestation activity do not come under purview of The Forest (Conservation) Act, 1980. |
| Environment (Protection) Act, 1986 | The reforestation activity do not come under scope of The Environment (Protection) Act, 1986. |

Each act or rule has been described as following.

(1) Water (Prevention and Control of Pollution) Act, 1974 with Rules10. - The act and rules adopted by the Republic of India in 1974 do not cover and not applicable to reforestation activity.

10 https://cpcb.nic.in/upload/home/water-pollution/WaterAct-1974.pdf

(2) Biological Diversity Act, 2002[11] - By going through the Biological Diversity Act, 2002, it is clear that there is no mention of reforestation project activity on barren land or any other lands. Therefore, this act is not applicable.

(3) The Indian Forest Act (1927)[12] - The Indian Forest Act is applicable for the following types of forests and forest produce:

(i) Reserved forests - The reforestation project activity do not fall under the reserved forest category. The lands under reforestation project activity are barren private lands owned by individual farmers and tribal people. Reserve forests are the most restricted forests and are constituted by the State Government on any forest land or wasteland which is the property of the Government.

(ii) Protected forests - The reforestation project activity do not fall under the protected forest category. Protected Forest of India are natural forests areas where the habitat and resident wild animal and plant species have certain degree of protection. The reforestation project activity has been carried out on privately owned lands and therefore do not fall under protected forest areas.

(iii) Village forests - Village forests are the one in which the State Government may assign to 'any village community the rights of Government to or over any land which has been constituted a reserved forest'. The lands under the reforestation activity are privately owned and not owned by the government and therefore rules for village forests will not be applicable.

(iv) The control over forests and lands not being the property government -

The Government of India may, by notification, regulate or prohibit in any forest or waste land-

(i) the breaking up or clearing of land for cultivation - the lands under the reforestation project activity were barren before the project activity and were selected for reforestation activity and not for crop cultivation.

(ii) the pasturing of cattle - the lands under the reforestation project activity do not cover the pasturing of cattle.

(iii) setting fire to or clearing of the vegetation - The lands under the reforestation activity were barren before the project activity and therefore no clearing or vegetation or setting fire were done or encouraged.

(v) The duty on timber and other forest-produce - This clause is exclusively for imposing duty on timber and other forest-produce and not for any reforestation project activity.

(vi) The control of timber and other forest-produce in transit - this clause of the act is applicable for timber and other forest produce in transit and therefore do not cover the reforestation activity.

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11https://web.archive.org/web/20111030184228/http://envfor.nic.in/divisions/biodiv/act/bio_div_act_2002.pdf

12https://cdnbbsr.s3waas.gov.in/s3c5866e93cab1776890fe343c9e7063fb/uploads/2021/05/2021051236.pdf

(vii) The collection of drift and stranded timber - his clause of the act is applicable for unclaimed and stranded timber and other forest produce and therefore do not cover the reforestation activity.

By studying aforementioned clauses of The Indian Forest Act (1927), it is clear that the act do not apply to the reforestation project activity.

(4) Forest (Conservation) Act, 198013 - The Forest (Conservation) Act, 1980 of India basically about the restriction on the dereservation of forests or use of forest land for non-forest purpose. The lands under the reforestation project activity do not come under the forest cover. They were privately owned land and therefore provisions of Forest (Conservation) Act, 1980 will not be applicable.

(5) Environment (Protection) Act, 198614 - The Environment (Protection) Act, 1986 was enacted to lay down the rules related to environmental pollution, the procedures and safeguards for the handling of hazardous substances, the prohibition and restrictions on the handling of hazardous substances in different areas, the prohibition and restriction on the location of industries and the carrying on process and operations in different areas, and the procedures and safeguards for the prevention of accidents which may cause environmental pollution and for providing for remedial measures for such accidents. In the present reforestation project activity, hazardous chemicals or substances are not involved. No hazardous chemicals mentioned in Schedule I and Schedule II of "The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 200815" were used in the reforestation project activity. There is no mention of maximal allowable limits of pollutants from reforestation project activity in the Environment (Protection) Act, 1986. In addition, no chemicals were handled or stored or manufactured in the reforestation project activity described in Scheduled I and Scheduled II list of chemicals in "The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989" 16. No parasites, human pathogens, bacteria, virus, protozoa and nematodes were used, imported, exported or stored as per "The Rules the Manufacture, Use, Import, Export and Storage of Hazardous Micro-Organisms Genetically Engineered Organisms or Cells, 198917". Therefore, Environment (Protection) Act, 1986 is not applicable to the reforestation project activity.

13 http://moef.gov.in/wp-content/uploads/2018/03/Forest.pdf

14 https://www.indiacode.nic.in/bitstream/123456789/4316/1/ep_act_1986.pdf

15 https://npcb.nagaland.gov.in/wp-content/uploads/2016/03/HWM-2008.pdf

16http://nagarikmancha.org/images/MANUFACTURE,%20STORAGE%20AND%20IMPORT%20OF%20HAZARDOUS%20CHEMICAL%20RULES,%201989.pdf

17http://nbaindia.org/uploaded/Biodiversityindia/Legal/28.%20Rules%20for%20the%20manufacture,%20use%20import%20export%20and%20storage%20of%20hazardous%20microorganism%20genetically%20engineered%20organisms%20or%20cells,%201989.pdf

Apart from the aforementioned national laws and acts, there are state-specific acts which have been described as following. The project activity is spread over three states of India - (i) Orissa (now renamed as Odisha); (ii) Andhra Pradesh; and (iii) Chhattisgarh. Each state has their own laws/acts/ regulations for forests.

(i) Orissa (now renamed as Odisha) - The state of Orissa adopted its forest act in the year of 1972 - "The Orissa Forest Act, 197218". The act is applicable for the following:

(a) **Reserved Forests -** The lands under the reforestation project activity do not fall under the reserved forest category. The lands privately owned which were barred prior to the project activity.

(b) **Village Forests** - According to the Act, the State Government may, by notification, constitute any land at their disposal to be a village forest for the benefit of any village community or group of village communities, and may in manner vary or cancel any such notification. The lands selected for the reforestation project activity is owned by the individual private land owners and not owned by the State Government Forest Department. Therefore, lands under the project activity cannot be designated as Village Forests.

(c) **Protected Forests** - The lands under the reforestation project activity are privately owned lands and do not fall under protected forests.

(d) **The control over forests and lands not being the property of the government or over which government have joint interest** -

The State Government of Orissa may, by notification, regulate or prohibit in any forest or waste land-

(i) the breaking up or clearing of land for cultivation - the lands under the reforestation project activity were barren before the project activity and were selected for reforestation activity and not for crop cultivation.

(ii) the pasturing of cattle - the lands under the reforestation project activity do not cover the pasturing of cattle.

(iii) setting fire to or clearing of the vegetation - The lands under the reforestation activity were barren before the project activity and therefore no clearing or vegetation or setting fire were done or encouraged.

(e) **The control of timber and other forest produce in transit or possession -** It is applicable for control of timber or other forest produced and not applicable for the reforestation project activity.

**(f) The collection of drift and stranded timber** - It is for specifically for timber and not for reforestation project activity.

**(g) Provisions related to sandal wood** - this clause is applicable for sandal wood and not for reforestation project activity.

By Analyzing aforementioned clauses of 'The Orissa Forest Act, 1972', it clear that the reforestation project activity do not violate any clauses of the act.

18 https://forest.odisha.gov.in/sites/default/files/2020-01/5TOFA_1972.pdf

(ii) Andhra Pradesh - The state government of Andhra Pradesh adopted its "The Andhra Pradesh Water, Land and Trees Rules, 2004" or WALTA Rules, 200419. Under the WALTA Rules, 2004 every Municipal Corporation or Municipality or other local area shall plant or maintain certain number of trees in the following areas:

(a) Residential areas;

(b) Commercial or institutional areas; and

(c) Industrial areas.

The reforestation project has been carried out on many small parcels of private lands owned by the poor farmers and tribal people in locations which do not fall under residential areas, commercial or institutional areas or industrial areas. Therefore, WALTA Rules, 2004 are not applicable on the lands under reforestation project activity.

(iii) Chhattisgarh - The state government of Chhattisgarh adopted its forest policy on 22 October 2001 - "Chhattisgarh State Forest Policy 200120", which emphasizes on afforestation for the purpose of fuel wood and fodder supply rather than restoring the degraded lands. This policy is a guiding document for the government plans and not a mandatory government policy instrument for encouraging forestry on privately owned degraded/ degrading lands. Under the paragraph 4.10.2, it is mentioned that "*Planting of trees along side of roads, railway lines, rivers, streams and canals, and on other unutilized lands under the state, corporate, institutional or private ownership should be encouraged. Green belts should be raised in urban/industrial /mined out areas. Such a program will also help to improve the microclimate of the concerned area.*" As from this statement, it is evident that planting of trees on the private establishments in Chhattisgarh is encouraged but it is not mandatory.

## 1.15 Participation under Other GHG Programs

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

The project is registered under UNFCCC Clean Development Mechanism (CDM) standard (Registration number: 5016; date of registration: 01.08.2011).

### Projects Rejected by Other GHG Programs

1.15.1 The project is not rejected by other GHG Programs.

## 1.16 Other Forms of Credit

1.15.2

19 http://forests.ap.gov.in/PDF/GOs/WALTA_RULES_2004.pdf

20https://www.cgmfpfed.org/new/act_rules/Chhattisgarh%20Forest%20Policy%20Act%202001%20(English).pdf

### Emissions Trading Programs and Other Binding Limits

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

### Other Forms of Environmental Credit

1.16.1 Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 1.17 Additional Information Relevant to the Project

1.16.2

### Leakage Management

No significant leakage is anticipated from the project activity.

Leakage due to the displacement of grazing and cultivation is unlikely to occur as there are sufficient existing grazing lands under the control of the animal owners that can adopt displaced animals even if all pre-project animals are displaced to existing lands outside the project boundary

### Commercially Sensitive Information

There is no commercially sensitive information in the project activity.

### Sustainable Development

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

### Further Information

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

# 2 SAFEGUARDS

## 2.1 No Net Harm

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 2.2 Local Stakeholder Consultation

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 2.3 Environmental Impact

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 2.4 Public Comments

Please Refer to CDM PDD - Project 5016: Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 2.5 AFOLU-Specific Safeguards

Please Refer to CDM PDD - Project 5016 : Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

# 3 APPLICATION OF METHODOLOGY

## 3.1 Title and Reference of Methodology

Approved large scale afforestation/reforestation CDM methodology – "AR-ACM0001 - Afforestation and reforestation of degraded land --- Version 4" has been applied[21].

## 3.2 Applicability of Methodology

The project activity complies with the applicability conditions of the approved methodology AR-ACM0001 Version 4 as follows:

**Table 7** Applicability conditions of the methodology

| Applicability conditions | Justifications |
|---|---|

[21] https://cdm.unfccc.int/UserManagement/FileStorage/NQOMTAU7I5J4LWK08XY9VRHSGCFZ31

| | |
|---|---|
| The A/R CDM project activity is implemented on degraded lands, which are expected to remain degraded or to continue to degrade in the absence of the project, and hence the land cannot be expected to revert to a non-degraded state without human intervention | "Tool for identification of degraded or degrading lands for consideration in implementing CDM A/R Project activities (Version 01)" was applied to establish that the lands in proposed CDM activity are degraded land.<br><br>1. Verifiable document in the form of Land Patta or Land Pass Book is available in respect of each parcel issued by local Land Revenue Authorities of respective State Government wherein the land has been categorized as "Donger", "Parat"or "Mettu bhumi" in Odisha (previous name Orissa), Andhra Pradesh and Chhattisgarh respectively. Further Tehsildar of the area, official from land revenue department of the State Government, have certified that the Donger, Parat and Mettubhumi are the nomenclature used locally for degraded land in the states of Odisha, Chhatishgarh and Andhra Pradesh respectively.<br><br>2. The company appointed M/s Salim Ali Centre for Ornithology & Natural History (SACON) under Ministry of Enviroment, Forest & Climate Change (MoEFCC), Government of India for conducting GIS mapping of the project area including Change detection study to know the status of land during 1990 period. Satellite images of 1990 period have been generated by overlaying the current GIS map of the project parcels over the Landsat Thematic Mapper Satellite data of 1990 period available from Global Land Cover Facility (GLCF). These images show that the parcels of land under project activity was under degraded category.<br><br>3. Further Participatory Rural Appraisal (PRA) that was conducted by one NGO of the area in 2008-09 also gathered information on land use/cover history past and current. It is found from the PRA study that the land was degraded land, not fit for any agricultural activity and thus lying barren since decades or from the period of their forefathers. Many of the land owners or their forefathers tried to cultivate agricultural crop on their land (partly or wholly) in the past but failed because of degraded nature of land. Either the yield was so poor due to poor fertility that they could not afford to continue or the crop dried totally in absence of irrigation. |

| | |
|---|---|
| Encroachment of natural tree vegetation that leads to the establishment of forests according to the host country definition of forest for CDM purposes is not expected to occur. | Prior to the implementation of the project activity the land under the project boundary were degraded lands without considerable flora due to severe soil erosion without topsoil. Encroachment of natural tree is not possible as the project activity has been implemented on degraded land without topsoil due to severe soil erosion in the past as well as continued degradation without considerable flora. The area frequently faced natural calamities like drought and excessive rains. The speech in 50th National Development Council meeting on 21st December, 2002 by the then Chief Minister of Odisha reveals that the state was ravaged by as many as 15 major calamities since 1963. The super cyclone in October 1999, severe droughts in 2000 & 2002 and excessive rain fall in 2001 have ravaged almost the entire state causing colossal losses especially in rural areas (http://planningcommission.gov.in/plans/planrel/pl50ndc/Odisha.pdf). On the contrary study report says there are indications of desertification in many parts of the state especially in western and southern uplands. The study by Water Initiatives of Odisha (WIO), a NGO in the state claimed that the rate of land degradation is going up at an alarming pace and Odisha could well turn to barren and a land mass akin to desert in next 150 years. "In just 13 years from 1991-92 to 2004-05, severely degraded land in the state has increased by 136%, barren land by 69% and land converted to non-agricultural uses by 34%", the WIO coordinator said (http://www.rediff.com/news/2006/nov/01Odisha.htm).<br>From above it is quite evident that the land where natural encroachment of trees could not happen till 2001 cannot be expected to happen even after 2001 unless significant changes are brought in by human intervention. The greenery/vegetation seen post monsoon is a temporary scenario that grows every year during rains. But everything dries up in summer leaving the land barren without any vegetation, thus leaving no option for natural encroachment of trees. Moreover the conditions responsible for degradation has neither changed nor mitigated in the area as explained below.<br><br>1. The first being the topography of the area, the land is undulated where top soil washes away due to excessive rain |

| | |
|---|---|
| | every year. Top soil is also carried away by the high wind in summer causing further degradation and thus natural tree vegetation is not at all likely.<br><br>2. Secondly the land has become degraded due to many years of anthropogenic activities like population growth, high dependency of local people on forest products for their livelihood and construction material for their houses etc. Remote location and poor road connectivity make it economically unattractive for any other kind of investment, thus leading to thinning of forest areas.<br><br>3. Thirdly the illegal felling (fuel wood is the only medium of cooking) do not allow the young regeneration to reach woody stage as they prevents establishment of forest. Even the vegetation that progresses to woody stage is bushy and suppressed due to continuous damage due anthropogenic pressure and grazing activities. Hence, the establishment of natural regeneration is impossible without management interventions such as proper training on plantation technique, restrictions on illegal felling, limited grazing etc. |
| Flooding irrigation is not part of the project activity | No flooding irrigation planned or happened in the project site. |
| If at least a part of the project activity is implemented on organic soils, drainage of these soils is not allowed and not more than 10% of their area may be disturbed as result of soil preparation for planting | Project activity is not implemented on organic soils. The land contains low organic carbon as is evident from the soil reports of pre-project era. Soil testing was conducted Gram Panchayat wise in undivided Koraput Revenue District by Soil Testing Laboratory Semiliguda, Govt. of Odisha, during the period from 1995-96 to 1999-2000. The undivided Koraput included the present districts of Koraput, Nabarangpur and Malkangiri where the project is located. The report which is based on analysis of 32000 plus samples tested Gram Panchayat wise show that the organic carbon content is below 0.5% which indicates low organic carbon in the project area. The report is available in the Soil Testing Laboratory, Sindhiguda. Thus the project activity is not implemented on organic soil. |

| | |
|---|---|
| The establishment of project shall not decrease availability of fuel wood. | The pre project fuel wood collection on the project sites happens on a marginal level and the same is not affected with the implementation of project activity. The areas are degraded; very few trees are present on project parcels those are sometimes used for fuel wood collection. But the amount per hectare works out nearly zero and would be difficult to monitor and measure. Local villagers usually harvest herbaceous and shrub biomass for fuel wood. They can collect fuel wood still within the project boundary by gathering dead wood and branches and shrubs growing between the trees. |

## 3.3 Project Boundary

The project activity contains more than one discrete parcel of land. The project activity includes reforestation of 12,437 parcels of land distributed over seven districts across three states belonging to 12002 farmers. For administrative control the parcels are grouped bank area wise and assigned to the branch of financing bank from where the farmer has availed loan. Each discrete parcel is represented by the name of the farmer has been assigned with a unique identification no. which will be used consistently throughout the PDD and monitoring the project activity as detailed in Table below. The unique identification no contains three letters followed by three digits e.g. "XXX000. The letters 'XXX' represent bank area, first letter for district, 2nd & 3rd letter for Bank area and the digits '000' represent serial no of the parcel. More than one parcel of same farmer is further identified adding (a), (b), (c).... with the serial no.

**Table 8** Unique Identification of Parcels planted year wise

| # | District and state | Bank Area | Area ID | No. of parcels planted yearwise | | | | | | | Total | Unique identification number of parcels |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | | |
| | ODISHA | | | St 1 | St 2 | St 3 | St 4 | St 5 | St 6 | St 7 | | |
| 1 | NABARANGPUR | Nandahandi | NNH | 25 | 4 | 7 | 33 | 31 | 22 | 38 | 160 | NNH001 to 136 |
| 2 | | Nabarangpur | NNP | 7 | 14 | 31 | 59 | 66 | 57 | 51 | 285 | NNP001 to 262 |
| 3 | | Sindhiguda | NSG | 12 | 5 | 10 | 18 | 16 | 32 | 46 | 139 | NSG001 to 130 |
| 4 | | Rajoda | NRJ | 8 | 21 | 25 | 15 | 20 | 26 | 37 | 152 | NRJ001 to 148 |
| 5 | | Tumberla | NTB | 3 | 3 | 4 | 9 | | | | 19 | NTB001 to 024 |
| 6 | | Kosagumuda | NKM | 8 | 17 | 20 | 18 | 14 | 15 | 46 | 138 | NKM001 to 136 |
| 7 | | Jotabal | NJB | 3 | 8 | 19 | 12 | 48 | 27 | 19 | 136 | NJB001 to 133 |
| 8 | | Katharguda | NKG | 8 | 17 | 32 | 26 | 11 | 23 | 39 | 156 | NKG001 to 152 |
| 9 | | Kumuli | NKL | 13 | 23 | 32 | 39 | 39 | 21 | 40 | 207 | NKL001 to 192 |
| 10 | | B Singhpur | NBS | 10 | 12 | 18 | 14 | 15 | 19 | 77 | 165 | NBS001 to 157 |
| 11 | | Sanmosigaon | NSM | 18 | 27 | 39 | 67 | 59 | 42 | 29 | 281 | NSM001 to 282 |
| 12 | | Challanguda | NCG | 10 | 14 | 16 | 50 | 35 | 20 | 73 | 218 | NCG001 to 204 |
| 13 | | Dhamnahandi | NDH | 12 | 10 | 9 | | | 19 | 14 | 64 | NDH001 to 061 |
| 14 | | Raighar | NRG | | 28 | 5 | 116 | 57 | 59 | 92 | 357 | NRG001 to 400 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | | Jharigaon | NJG | | 36 | 26 | 46 | 66 | 70 | 73 | 317 | NJG001 to 321 |
| 16 | | Dhodra | NDD | | 12 | 12 | 22 | 58 | 74 | 29 | 207 | NDD001 to 211 |
| 17 | | Kotagaon | NKT | | 43 | 8 | 10 | 25 | 36 | 61 | 183 | NKT001 to 187 |
| 18 | | Umerkote | NUK | | 8 | 16 | 22 | 6 | 29 | 54 | 135 | NUK001 to144 |
| 19 | | Sosahandi | NSH | | 12 | 23 | 39 | 43 | 20 | 10 | 147 | NSH001 to 141 |
| 20 | | Singsari | NSS | | 23 | 20 | 25 | | | | 68 | NSS001 to 069 |
| 21 | | Turudhi | NTD | | 28 | 13 | | | | 14 | 55 | NTD001 to 060 |
| 22 | | Chandili | NCD | | 3 | | 8 | 10 | 11 | 21 | 53 | NCD001 to 053 |
| 23 | | Kundei | NKN | | 13 | 8 | | 9 | | | 30 | NKN001 to 032 |
| 24 | | Boriguma | NBG | | 5 | | 19 | | | | 24 | NBG001 to 025 |
| 25 | | Kodinga | NKD | | | 4 | 6 | 4 | | 44 | 58 | NKD001 to 058 |
| 26 | | Tentulikuthi | NTK | | | | 25 | 61 | 71 | 41 | 198 | NTK001 to 175 |
| 27 | | Maidalpur | NMP | | | | 36 | 44 | 12 | 23 | 115 | NMP001 to 118 |
| | | **Total:** | | **137** | **386** | **397** | **734** | **737** | **705** | **971** | **4067** | **3891 Farmers** |
| 1 | **KORAPUT** | Boipariguda | KBG | 67 | 66 | 40 | 22 | 39 | 40 | 43 | 317 | KBG001 to 314 |
| 2 | | Ramgiri | KRG | 17 | 29 | 29 | 37 | 73 | 58 | 44 | 287 | KRG001 to 291 |
| 3 | | Kundra | KKN | 28 | 26 | 34 | 58 | 100 | 91 | 81 | 418 | KKN001 to 416 |
| 4 | | Digapur | KDG | 16 | 19 | 37 | 57 | 88 | 89 | 51 | 357 | KDG001 to 355 |
| 5 | | Dongerpausi | KDP | 14 | 23 | 30 | 47 | 71 | 111 | 111 | 407 | KDP001 to 399 |
| 6 | | Ambaguda | KAG | 3 | 2 | 14 | 17 | 39 | 28 | | 103 | KAG001 to 100 |
| 7 | | Kusumi | KKS | 13 | 15 | 32 | 102 | 58 | 61 | 64 | 345 | KKS001 to 344 |
| 8 | | Phamphuni | KPP | 13 | 16 | 23 | 42 | 53 | 65 | 65 | 277 | KPP001 to 277 |
| 9 | | Nandpur | KNP | 33 | 55 | 67 | 86 | 101 | 108 | 136 | 586 | KNP001 to 575 |
| 10 | | Padwa | KPD | 7 | 35 | 21 | 39 | 47 | 44 | 20 | 213 | KPD001 to 238 |
| 11 | | Lamtaput | KLP | 11 | 9 | 40 | 75 | 22 | 30 | 61 | 248 | KLP001 to 262 |
| 12 | | Mathalput | KMP | 11 | 7 | 36 | 40 | 18 | 5 | 12 | 129 | KMP001 to 136 |
| 13 | | Jolaput | KJP | 11 | 9 | 18 | 28 | 36 | 10 | 35 | 147 | KJP001 to 166 |
| 14 | | Semiliguda | KSG | 4 | 3 | 21 | 30 | 41 | 62 | 57 | 218 | KSG001 to 220 |
| 15 | | Koraput | KKP | 6 | 9 | 8 | 12 | 7 | 6 | | 48 | KKP001 to 057 |
| 16 | | Podagada | KPG | 5 | 14 | 19 | 48 | 49 | 62 | 60 | 257 | KPG001 to 330 |
| 17 | | Kakriguma | KKG | 9 | 11 | 18 | 9 | | 18 | | 65 | KKG001 to 066 |
| 18 | | Dasmantpur | KDS | | 8 | 28 | 37 | 43 | 38 | 54 | 208 | KDS001 to 223 |
| 19 | | Pottangi | KPT | | 6 | 6 | 14 | 25 | 17 | 25 | 93 | KPT001 to 105 |
| 20 | | Sunki | KSN | | 5 | 35 | 42 | 21 | 18 | 20 | 141 | KSN001 to 178 |
| 21 | | Jeypore | KJR | | | | 34 | 36 | 12 | | 82 | KJR001 to 081 |
| 22 | | Sunabeda | KSB | | | | 2 | 27 | 5 | 9 | 43 | KSB001 to 043 |
| 23 | | Onkadeli | KOD | | | | | 11 | | | 11 | KOD001 to 011 |
| | | **Total:** | | **268** | **367** | **556** | **878** | **1005** | **978** | **948** | **5000** | **4938 Farmers** |
| 1 | **MALKANGIRI** | Pangam | MPG | 2 | 5 | 12 | 49 | 22 | | | 90 | MPG001 to 091 |
| 2 | | Maithili | MML | | 1 | 1 | 3 | 12 | 27 | 100 | 144 | MML001 to 157 |
| 3 | | Malkangiri | MMG | | | 20 | 59 | 83 | 81 | 11 | 254 | MMG001 to 253 |
| 4 | | Kudumulguma | MKG | | 7 | 7 | | 11 | 1 | | 26 | MKG001 to 034 |
| | | **Total:** | | **2** | **13** | **40** | **111** | **128** | **109** | **111** | **514** | **511 Farmers** |
| | **ANDHRA PRADESH** | | | | | | | | | | | |
| 1 | **VISHAKHAPATNAM** | Arkuvalley | VSA | | | | | 107 | 245 | 394 | 746 | VSA001 to 1316 |
| 2 | | Kinchumanda | VSK | | | | | 137 | 270 | 343 | 750 | VSK001 to 1099 |
| 3 | | Paderu | VSP | | | | | | 272 | 137 | 409 | VSP001 to 1215 |
| | | **Total:** | | | | | | **244** | **787** | **874** | **1905** | **1728 Farmers** |
| 1 | **VIZIANAGARAM** | Sallur | VZS | | | | | 31 | 22 | 1 | 54 | VZS001 to 096 |
| 2 | | Gajpatinagram | VZG | | | | | 2 | | | 2 | VZG001 to 002 |
| | | **Total:** | | | | | | **33** | **22** | **1** | **56** | **52 Farmers** |
| 1 | **SRIKAKULAM** | Kottur | SKT | | | | 45 | 28 | | | 73 | SKT001 to 081 |
| 2 | | Veergatham | SVG | | | | | 220 | | | 220 | SVG001 to 308 |
| 3 | | Palkonda | SPK | | | | | 53 | | | 53 | SPK001 to 058 |
| | | GL Puram | SGL | | | | | | 5 | | 5 | SGL001 to 005 |
| | | **Total:** | | | | | **45** | **301** | **5** | **0** | **351** | **338 Farmers** |
| | **CHHATTISGARH** | | | | | | | | | | | |
| 1 | | Bastar | BBS | | | | | 101 | 198 | 52 | 351 | BBS001 to 351 |
| 2 | | Lohaniguda | BLH | | | | | 30 | 36 | 24 | 90 | BLH001 to 090 |
| 3 | | Bhanpuri | BBH | | | | | 8 | 36 | | 44 | BBH001 to 044 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | Kesharpal | BKP | | | | | | 38 | | 38 | BKP001 to 038 |
| 5 | | Bokaband | BBK | | | | | | 12 | | 12 | BBK001 to 012 |
| 6 | | Bojaband | BBJ | | | | | | 9 | | 9 | BBJ001 to 009 |
| | | **Total:** | | | | | | **139** | **329** | **76** | **544** | **544 Farmers** |
| **69** | **Grand Total:** | | | **407** | **766** | **993** | **1768** | **2587** | **2935** | **2981** | **12437** | **12002 Farmers** |

**Table 9** Geographic delineation - GIS Maps & Coordinates bank area wise

| # | Bank area | No. of parcels | Unique ID no. of farmers | Map ID no. | No. of maps | GIS Coordinates of Bank Area | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | From | To | From | To |
| 1. | NABARANGPUR | | | | | Latitude | | Longitude | |
| 1 | Nandahandi | 160 | NNH001 to 136 | N 01 | 1 | 19 09 22.2 N | 19 17 02.3 N | 82 37 01.2 E | 82 46 14.8 E |
| 2 | Nabarangpur | 285 | NNP001 to 262 | N02–N05 | 4 | 19 09 53.5 N | 19 19 33.6 N | 82 18 13.4 E | 82 40 02.1 E |
| 3 | Sindhiguda | 139 | NSG001 to 130 | N 06 | 1 | 19 09 25.3 N | 19 16 09.0 N | 82 31 58.0 E | 82 40 26.0 E |
| 4 | Rajoda | 152 | NRJ001 to 148 | N 07 | 1 | 19 08 43.0 N | 19 17 02.8 N | 82 09 49.2 E | 82 21 23.9 E |
| 5 | Tumberla | 19 | NTB001 to 024 | N 08 | 1 | 19 19 40.8 N | 19 22 21.5 N | 82 32 15.0 E | 82 37 02.1 E |
| 6 | Kosagumuda | 138 | NKM001 to 136 | N10–N11 | 2 | 19 08 56.8 N | 19 19 12.5 N | 82 08 46.9 E | 82 16 48.6 E |
| 7 | Jotabal | 136 | NJB001 to 134 | N11–N12 | 2 | 19 20 23.0 N | 19 27 00.7 N | 82 24 05.1 E | 82 30 35.7 E |
| 8 | Kathargada | 156 | NKG001 to 152 | N13–N14 | 2 | 19 05 07.0 N | 19 10 03.6 N | 82 40 59.6 E | 82 46 23.8 E |
| 9 | Kumuli | 207 | NKL001 to 192 | N15–N16 | 2 | 19 03 19.1 N | 19 11 00.1 N | 82 38 35.9 E | 82 43 40.0 E |
| 10 | B Singpur | 165 | NBS001 to 157 | N17–N18 | 2 | 18 58 25.8 N | 19 07 43.8 N | 82 35 03.9 E | 82 42 22.2 E |
| 11 | Sanmosigaon | 281 | NSM001 to 282 | N19–N21 | 3 | 19 11 47.2 N | 19 19 46.1 N | 82 20 26.1 E | 82 29 36.7 E |
| 12 | Chalanguda | 218 | NCG001 to 204 | N22–N25 | 4 | 19 01 59.3 N | 19 12 32.8 N | 82 29 51.4 E | 82 39 53.7 E |
| 13 | Dhamnahandi | 64 | NDH001 to 061 | N 26 | 1 | 19 04 47.7 N | 19 07 50.5 N | 82 16 51.9 E | 82 19 13.9 E |
| 14 | Raighar | 357 | NRG001 to 400 | N27–N29 | 3 | 19 49 19.9 N | 19 58 40.8 N | 81 33 01.2 E | 82 45 42.8 E |
| 15 | Jharigaon | 317 | NJG001 to 321 | N30–N33 | 4 | 19 31 57.2 N | 19 45 55.0 N | 82 11 26.0 E | 82 27 25.2 E |
| 16 | Dhodra | 207 | NDD001 to 211 | N34–N37 | 4 | 19 32 38.7 N | 19 46 50.8 N | 82 10 22.4 E | 82 21 13.6 E |
| 17 | Kotagaon | 183 | NKT001 to 187 | N38–N40 | 3 | 19 19 16.4 N | 19 28 06.2 N | 82 09 56.2 E | 82 21 26.9 E |
| 18 | Umerkote | 135 | NUK001 to144 | N41–N43 | 3 | 19 37 04.1 N | 19 44 07.8 N | 82 04 43.3 E | 82 17 10.9 E |
| 19 | Sosahandi | 147 | NSH001 to 141 | N44- N45 | 2 | 19 00 50.0 N | 19 10 23.7 N | 82 26 07.1 E | 82 33 37.9 E |
| 20 | Singsari | 68 | NSS001 to 069 | N46–N48 | 3 | 19 23 01.9 N | 19 35 01.4 N | 82 03 42.1 E | 82 21 26.8 E |
| 21 | Turudhi | 55 | NTD001 to 060 | N 49 | 1 | 19 53 04.1 N | 19 59 23.8 N | 81 50 53.3 E | 81 56 14.1 E |
| 22 | Chandili | 53 | NCD001 to 053 | N 50 | 1 | 19 00 26.6 N | 19 06 44.6 N | 82 12 12.2 E | 82 21 38.8 E |
| 23 | Kundei | 30 | NKN001 to 032 | N 51 | 1 | 20 01 13.0 N | 20 04 12.2 N | 81 46 55.8 E | 81 59 29.1 E |
| 24 | Borigumma | 24 | NBG001 to 025 | N 52 | 1 | 19 00 07.1 N | 19 08 25.5 N | 82 34 50.1 E | 82 41 41.9 E |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 25 | Kodinga | 58 | NKD001 to 058 | N53–N54 | 2 | 19 14 56.4 N | 19 24 09.6 N | 82 15 43.0 E | 82 22 28.7 E |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 26 | Tentulikuthi | 198 | NTK001 to 175 | N 55 | 1 | 19 14 07.1 N | 19 19 23.5 N | 82 40 45.2 E | 82 45 31.7 E |
| 27 | Maidalpur | 115 | NMP001 to 118 | N56–N58 | 3 | 19 24 16.1 N | 19 33 25.1 N | 82 13 15.0 E | 82 38 57.3 E |
| | **Total:** | **4067** | | | **58** | | | | |
| **2.** | **KORAPUT** | | | | | | | | |
| 1 | Boipariguda | 317 | KBG001 to 314 | K01–K02 | 2 | 18 40 33.8 N | 18 49 39.4 N | 82 16 28.1 E | 82 28 16.2 E |
| 2 | Ramgiri | 287 | KRG001 to 291 | K03–K05 | 3 | 18 41 57.0 N | 18 52 17.5 N | 82 10 30.6 E | 82 21 08.9 E |
| 3 | Kundra | 418 | KKN001 to 416 | K06–K07 | 2 | 18 49 36.8 N | 19 00 08.1 N | 82 16 56.0 E | 82 25 05.6 E |
| 4 | Digapur | 357 | KDG001 to 355 | K08–K09 | 2 | 18 46 09.3 N | 18 53 03.9 N | 82 18 06.2 E | 82 30 18.2 E |
| 5 | Dongerpaunsi | 407 | KDP001 to 399 | K10–K11 | 2 | 18 50 49.5 N | 19 01 00.6 N | 82 21 38.3 E | 82 27 39.1 E |
| 6 | Ambaguda | 103 | KAG001 to 100 | K 12 | 1 | 18 56 27.9 N | 19 00 22.8 N | 82 30 15.1 E | 82 37 54.0 E |
| 7 | Kusumi | 345 | KKS001 to 344 | K13–K14 | 2 | 18 59 06.1 N | 19 06 13.4 N | 82 19 39.1 E | 82 28 45.8 E |
| 8 | Phamphuni | 277 | KPP001 to 277 | K15–K16 | 2 | 18 50 05.7 N | 18 57 50.4 N | 82 25 01.2 E | 82 31 11.4 E |
| 9 | Nandapur | 586 | KNP001 to 575 | K17–K20 | 4 | 18 29 03.1 N | 18 44 47.9 N | 82 29 35.4 E | 82 53 01.6 E |
| 10 | Padwa | 213 | KPD001 to 238 | K21–K22 | 2 | 18 16 07.2 N | 18 37 45.7 N | 82 34 47.7 E | 82 46 53.3 E |
| 11 | Lamtaput | 248 | KLP001 to 262 | K23–K25 | 3 | 18 29 00.4 N | 18 46 14.3 N | 82 30 33.3 E | 82 40 03.1 E |
| 12 | Mathalput | 129 | KMP001 to 136 | K 26 | 1 | 18 43 22.3 N | 18 49 59.8 N | 82 53 49.0 E | 82 58 58.0 E |
| 13 | Jolaput | 147 | KJP001 to 166 | K 27 | 1 | 18 25 16.6 N | 18 31 42.2 N | 82 33 32.1 E | 82 39 10.9 E |
| 14 | Semiliguda | 218 | KSG001 to 220 | K28–K30 | 3 | 18 33 02.6 N | 18 42 56.2 N | 82 46 11.4 E | 82 56 58.1 E |
| 15 | Koraput | 48 | KKP001 to 057 | K31–K32 | 2 | 18 47 10.8 N | 18 53 10.3 N | 82 38 09.9 E | 82 52 43.4 E |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 16 | Podagada | 257 | KPG001 to 330 | K33–K34 | 2 | 18 47 35.0 N | 18 56 50.3 N | 82 41 00.4 E | 82 59 29.8 E |
| 17 | Kakiriguma | 65 | KKG001 to 066 | K35–K36 | 2 | 18 52 04.4 N | 18 59 58.0 N | 82 53 06.2 E | 83 04 05.2 E |
| 18 | Dasmantpur | 208 | KDS001 to 223 | K37–K38 | 2 | 18 58 07.7 N | 19 09 29.6 N | 82 49 53.3 E | 83 00 05.3 E |
| 19 | Pottangi | 93 | KPT001 to 105 | K 39 | 1 | 18 27 45.6 N | 18 34 19.0 N | 82 51 39.1 E | 83 00 11.1 E |
| 20 | Sunki | 141 | KSN001 to 178 | K 40 | 1 | 18 22 38.1 N | 18 30 43.4 N | 82 55 22.2 E | 83 04 05.1 E |
| 21 | Jeypore | 82 | KJR001 to 081 | K 41 | 1 | 18 54 04.0 N | 18 59 26.7 N | 82 29 17.0 E | 82 35 40.0 E |
| 22 | Sunabeda | 43 | KSB001 to 043 | K 42 | 1 | 18 38 34.6 N | 18 45 27.0 N | 82 45 30.2 E | 82 53 37.3 E |
| 23 | Onkadili | 11 | KOD001 to 011 | K 43 | 1 | 18 30 01.5 N | 18 34 29.1 N | 82 25 09.0 E | 82 27 01.0 E |
| | **Total:** | **5000** | | | **43** | | | | |
| **3.** | **MALKANGIRI** | | | | | | | | |
| 1 | Pangam | 90 | MPG001 to 091 | M01–M02 | 2 | 18 22 58.1 N | 18 33 34.8 N | 82 01 43.4 E | 82 10 03.2 E |
| 2 | Maithili | 144 | MML001 to 157 | M 03 | 1 | 18 28 51.0 N | 18 36 52.2 N | 82 04 29.0 E | 82 13 30.2 E |
| 3 | Malkangiri | 254 | MMG001 to 253 | M04–M06 | 3 | 18 19 50.8 N | 18 29 37.6 N | 81 55 17.3 E | 82 06 15.2 E |
| 4 | Kudumulguma | 26 | MKG001 to 034 | M 07 | 1 | 18 15 31.4 N | 18 26 22.0 N | 82 05 29.6 E | 82 11 23.8 E |
| | **Total:** | **514** | | | **07** | | | | |
| **4.** | **VISAKHAPATNAM** | | | | | | | | |
| 1 | Arkuvalley | 746 | VSA001 to 1316 | VS01-02 | 2 | 18 10 22.6 N | 18 23 20.4 N | 82 01 28.9 E | 83 10 41.2 E |
| 2 | Kinchunmanda | 750 | VSK001 to 1099 | VS03-04 | 2 | 18 08 34.9 N | 18 26 37.8 N | 82 39 49.9 E | 82 52 49.8 E |
| 3 | Paderu | 409 | VSP001 to 1219 | VS05-06 | 2 | 18 01 19.5 N | 18 12 43.9 N | 82 32 24.7 E | 82 50 51.7 E |
| | **Total:** | **1905** | | | **06** | | | | |
| **5.** | **VIZIANAGARAM** | | | | | | | | |
| 1 | Sallur | 54 | VZS001 to 096 | VZ 01 | 1 | 18 24 58.5 N | 18 31 24.8 N | 83 00 12.0 E | 83 11 48.1 E |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 2 | Gajpatinagaram | 2 | VZG001 to 002 | VZ 02 | 1 | 18 30 54.2 N | 18 31 05.6 N | 83 07 31.3 E | 83 07 39.7 E |
| | **Total:** | **56** | | | **02** | | | | |
| **6.** | **SRIKAKULAM** | | | | | | | | |
| 1 | Kottur | 73 | SKT001 to 081 | S 01 | 1 | 18 37 33.4 N | 18 43 23.58 | 83 46 34.9 E | 83 49 23.9 E |
| 2 | Veergatham | 220 | SVG001 to 308 | S02-03 | 2 | 18 40 10.4 N | 18 46 24.8 N | 83 35 56.0 E | 83 41 38.0 E |
| 3 | Palkonda | 53 | SPK001 to 058 | S04-05 | 2 | 18 32 06.7 N | 18 44 14.7 | 83 41 59.6 E | 83 52 00.4 E |
| 4 | G L Puram | 5 | SGL001 to 005 | S 06 | 1 | 19 02 23.9 N | 19 03 11.2 N | 83 33 35.4 E | 83 39 51.1 E |
| | **Total:** | **351** | | | **06** | | | | |
| **7.** | **BASTAR** | | | | | | | | |
| 1 | Bastar | 351 | BBS001 to 351 | B01–B02 | 2 | 19 06 17.7 N | 19 19 05.5 N | 81 45 20.9 E | 81 59 45.3 E |
| 2 | Lohaniguda | 90 | BLH001 to 090 | B03–B05 | 3 | 19 04 48.3 N | 19 16 05.5 N | 81 35 01.9 E | 81 57 35.2 E |
| 3 | Bhanpuri | 44 | BBH001 to 044 | B 06 | 1 | 19 17 02.4 N | 19 21 07.4 N | 81 43 11.5 E | 81 48 38.7 E |
| 4 | Kesharpal | 38 | BKP001 to 038 | B07–B08 | 2 | 19 20 04.0 N | 19 25 25.9 N | 81 43 52.9 E | 81 54 51.7 E |
| 5 | Bokaband | 12 | BBK001 to 012 | B 09 | 1 | 19 14 08.7 N | 19 14 38.7 N | 82 03 29.5 E | 82 06 06.5 E |
| 6 | Bojawand | 9 | BBJ001 to 009 | B 10 | 1 | 19 12 54.6 N | 19 13 49.3 N | 82 07 07.0 E | 82 09 23.6 E |
| | **Total:** | **544** | | | **10** | | | | |
| | **Grand Total:** | **12437** | **Parcels** | | **132** | **Maps** | | | |


Sources and sinks of greenhouse gas is given the table below:

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Aboveground Biomass | $CO_2$ | Yes | Major carbon pool in the aboveground biomass in baseline tree vegetation. $CO_2$ is the only gas that is sequestered in aboveground biomass. |
| | | $CH_4$ | No | Not applicable to sequestration in aboveground biomass. |
| | | $N_2O$ | No | Not applicable to sequestration in aboveground biomass. |
| | Belowground Biomass | $CO_2$ | Yes | Major carbon pool in the belowground biomass in baseline tree vegetation. $CO_2$ is the only gas that is sequestered in belowground biomass. |
| | | $CH_4$ | No | Not applicable to sequestration in belowground biomass. |

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | $N_2O$ | No | Not applicable to sequestration in belowground biomass. |
| Project | Aboveground Biomass | $CO_2$ | Yes | Major carbon pool subjected to the project activity.CO2 is the only gas that is sequestered in aboveground biomass. |
| | | $CH_4$ | No | Do not get sequestered in aboveground biomass. |
| | | $N_2O$ | No | Do not get sequestered in aboveground biomass. |
| | Belowground Biomass | $CO_2$ | Yes | Major carbon pool subjected to the project activity. $CO_2$ is the only gas that is sequestered in aboveground biomass. |
| | | $CH_4$ | No | Do not get sequestered in belowground biomass. |
| | | $N_2O$ | No | Do not get sequestered in belowground biomass. |
| | Soil Organic Carbon | $CO_2$ | Yes | SOC may increase (when compared to baseline) due to implementation of the A/R CDM project activity.<br>The justifications are as following:<br>(i) The lands to be planted are not organic soils (e.g., peat lands), or wetlands. It is evident from the soil report of Soil chemist, Govt. of Odisha, India before start of the project that the character of soil is low to medium range. It is also evident from the PRA and land *patta* (Land title record) that before the project activity the land had no use and it was fallen as degraded land.<br>(ii) As per baseline vegetation survey altogether 3385 parcels were found with vegetation, 1902 parcels having scattered herbs and shrubs, trees with herbs and shrubs in 252 and only trees in 1231 out of 12437 parcels of the |

| Source | Gas | Included? | Justification/Explanation |
|---|---|---|---|
| | | | project area. Because of degraded nature of the land majority of parcels are barren without any woody vegetation. Herbs and shrubs that grow during the rains, dries and disappear automatically with the onset of summer. During site preparation at the best these herbs and shrubs are cleared which is less than 5% of the total area. Trees are essentially not removed at all.<br><br>(iii) Fine litter (woody twigs less than 2mm diameter, bark and leaves) remain on site. Its a usual practice in the area not to collect and remove leaves and fine litters from Eucalyptus plantation fields as they are not eaten by goats, cows and buffalos.<br><br>(iv) Approximately 1000 trees per acre are being planted which is established practiced, that is 2471 trees per hectare. Pits dug for planting are be small (40-45 cm in diameter and 30-35 cm in depth). Considering maximum pit diameter 45 cms, surface area per pit works out to be 0.15 $m^2$. Therefore, the surface area getting disturbed by the site preparation is estimated to be 0.15*2471 = 370.65 $m^2$ per hectare, that is, 3.7% of the total area planted. Therefore damage and disturbance to the soil per hectare was much lower than 5%.<br><br>(v) Ploughing for site preparation is done generally with country plough, tractor is also used by a few exceptional farmers who can afford it. But in all ploughing land contour is maintained. In no case land contour is disturbed /changed. It is neither required nor the farmers try as they normally do not afford the cost of changing the land contour. As the project activity satisfies all applicability conditions listed at paragraph 5.1.4 under soil organic carbon of the AR-ACM 001 Version 4[22] methodology the default method was be used. Accordingly the default values of ΔC = 0.5 t C |

[22] https://cdm.unfccc.int/UserManagement/FileStorage/NQOMTAU7I5J4LWK08XY9VRHSGCFZ31

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| | | | | per hectare per year and $T_e$ = 20 years has been considered. |
| | | $CH_4$ | No | Not a significant gas that get sequestered in SOC pool. |
| | | $N_2O$ | No | Not a significant gas that get sequestered in SOC pool. |
| | Burning of woody biomass | $CO_2$ | No | Site burning was not taken up and shall not be employed even in future. However, carbon stock decreases due to burning are accounted as a carbon stock change. |
| | | $CH_4$ | Yes | Non-$CO_2$ gas emitted from woody biomass burning. |
| | | $N_2O$ | No | Site burning was not taken up and shall not be employed even in future. However potential emissions are negligibly small. |

## 3.4 Baseline Scenario

Although the project sites are located in different states, the carbon status of all the sites in baseline scenario were more or less same. It is either low or decreasing. The *ex-ante* stratification is done by conducting field visits and assessing the soil condition of areas under the project. Local communities are interviewed (PRA conducted) to understand the land use land cover history. Few trees along with bushes of at the most 1 m height of different varieties and grasses and were found in a few parcels of the project area. The bushes and grass were visible during monsoon. But with the onset of summer only trees were left and all the bushes and grasses vanish. As per AR-ACM0001 (Version 04), section II.4 “changes in carbon stock of above ground and below ground biomass of non-tree vegetation may be conservatively assumed to be zero for all strata in the baseline scenario”. Based on this, the proposed A/R CDM project area is stratified depending on vegetation cover.

Two strata were identified as below:

1. Baseline Strata I: Project land with few growing trees

2. Baseline Strata II: Project land without trees

**Baseline Strata I: Project Land with few growing trees**

Based on Ecological survey report all the parcels containing trees through the entire project area has been shortlisted and assigned to Baseline strata I. A total of 8701 trees of different varieties in almost 252+1231=1483 parcels spreading across 2939.30 hectares of project area have been found out of which 252 parcels also contained scattered herbs & shrubs. The table below shows the list of trees recorded in the project area:

**Table 10** Baseline species

| S No | Common Name | Scientific Name | Family |
|---|---|---|---|
| 1 | Mango | *Mangifera indica* | Anacardiaceae. |
| 2 | Cashew | *Anacardium occidentale* | Anacardiaceae |
| 3 | Sal | *Shorea robusta* | Dipterocarpaceae |
| 4 | Teak | *Tectona grandis* | Lamiaceae |
| 5 | Mahuwa | *Madhuca longifolia* | Sapotaceae. |
| 6 | Kusum | *Schleichera oleosa* | Sapindaceae |
| 7 | Kendu | *Diospyros melanoxylon* | Ebenaceae |
| 8 | Karanji | *Pongamia pinnata* | Papilionaceae |
| 9 | Chakunda | *Cassia tora* | Caesalpinaceae |
| 10 | Jackfruit | *Artocarpus heterophyllus* | Moraceae |
| 11 | Guava | *Psidium gujav* | Myrtaceae |

| | | | |
|---|---|---|---|
| 12 | Pipal | *Ficus religiocia* | Moraceae |
| 13 | Castor | *Recinus cummunis* | Euphorbia |
| 14 | Kachnar | *Bombax Ceiba* | Malvales |
| 15 | Semal | *Bauhinia Semla* | Caesalpinaceae |
| 16 | Arjun | *Terminilia Arjuna* | Combretaceae |
| 17 | Beleric | *Terminalia Bellirica* | Combretaceae |
| 18 | Silver Oak | *Grevelia Robusta* | Proteaceae |
| 19 | Aonla | *Phyllanthus emblica* | Phyllanthaceae |
| 20 | Tendu | *Diospyros Celebica* | Ebenaceae |
| 21 | Tamarind | *Tamarindus indica* | Fabaceae |

**Baseline Strata II: Project Land without Trees**

The remaining 10954 parcels without growing trees are assigned to Baseline strata II. Because of degraded nature of land, majority of parcels are barren, however herbs and shrubs appearing especially during rains were noticed in almost 1902 parcels. The existing vegetation of the strata without growing trees is analyzed by using list quadrate method and census survey method which is extensively used for vegetation survey. Considering the huge size and the discrete nature of the project site, a quadrate of size 10 m X 10 m is taken for vegetation analysis. To ensure that the flora of the entire 252+1902 = 2154 parcels having bushes of different varieties is represented, 20% ie 430 discrete parcels belonging to different landholdings are selected for analysis. Representative quadrates identified for analyzing the qualitative characters of vegetation, the details of which are given below.

**Table 11** Baseline species

| S No | Name of the Species | Family | Habit |
|---|---|---|---|
| 1 | *Acacia nilotica* | Fabaceae | Tree |
| 2 | *Cassia tora* | Leguminosae | Herb |
| 3 | *Ipomea biloba* | Convolvulaceae | Herb |
| 4 | *Capparis aphylla* | Capparidaceae | Herb |
| 5 | *Croton bonplandianus* | Euphorbiaceae | Herb |
| 6 | *Achyranthes aspera* | Amarantaceae | Herb |
| 7 | *Parthenium hysterophorus* | Poaceae | Herb |
| 8 | *Tephrosia purpurea* | Pappilionaceae | Herb |
| 9 | *Cyperus diformis* | Cyperaceae | Herb |
| 10 | *Chloris montana* | Poaceae | Herb |

The table below shows the details of total area and no of parcels assigned to each of Baseline strata I and II, year wise:

**Table 10** Baseline stratification

| Strata | Plantation year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | Total |
| Total nos of Baseline trees | 358 | 526 | 710 | 1329 | 1778 | 1954 | 2046 | 8701 |
| No. of parcels per baseline strata: | | | | | | | | |
| Baseline Strata I (Parcels with trees) | 55 | 104 | 131 | 233 | 282 | 327 | 351 | 1483 |
| Baseline strata II (Parcels without trees) | 352 | 662 | 862 | 1535 | 2305 | 2608 | 2630 | 10954 |
| Total: | 407 | 766 | 993 | 1768 | 2587 | 2935 | 2981 | 12437 |
| Area per baseline strata (ha) | | | | | | | | |
| Baseline strata I | 73.30 | 169.97 | 254.63 | 418.35 | 620.82 | 673.95 | 728.28 | 2939.30 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (Parcels with trees) | | | | | | | | |
| Baseline strata II (Parcels without trees) | 447.28 | 830.91 | 946.71 | 1745.36 | 2402.79 | 2726.48 | 2930.63 | 12030.16 |
| Total | 520.58 | 1000.88 | 1201.34 | 2163.71 | 3023.61 | 3400.43 | 3658.91 | 14969.46 |

## 3.5 Additionality

The steps as outlined in the VCS tool VT0001 "Tool For The Demonstration And Assessment Of Additionality In VCS Agriculture, Forestry And Other Land Use (AFOLU) Project Activities" (Version 03) were followed to demonstrate that the proposed project activity is additional and not the baseline scenario. Both barrier arguments and investment analysis (steps 2 and 3) are applied.

**STEP 0. Preliminary screening based on the starting date of the VCS AFOLU project activity:**

The starting date of the project activity is after 31 December 1999: The project activity had started on 25.06.2001, the date on which first tripartite agreement was executed between the company, the farmer and the bank to undertake project activity. Though the project was started on 25.06.2001, carbon credit project documentation could not be started immediately after conceiving the project. The main reason being the company remained sick under BIFR till November, 2005. It needed in-depth analysis of company's business and background to explain the delays in carbon credit documentation.

**Why the documentation could not be started immediately after conceiving the project:**

The main reason that project developer could not start the documentation immediately after conceiving the project was financial constraints as well as absence of monitoring methodology. MTPL established its factory in extremely backward area. The Government of Odisha at the time of incorporation allotted land for plantation to the company on 20 years lease basis subject to payment of royalty. The company planted the area but at the time of harvesting, royalty issue got disputed because of charging royalty higher than the agreed one and was not allowed to harvest the crop. The company then moved to court of law and the matter is still subjudice. The company also planted lease hold land owned by group companies on piece meal basis as trial but soon realized that the resulting landed cost was too high and they can't continue due to high security expenses to prevent illegal felling. Gradually almost 90% net worth wiped out with accumulated losses and the company was finally adjudged sick under SICA by BIFR in December, 1998. The company remained sick till November, 2005 when BIFR discharged the company from the purview of SICA vide their order dated 22-November-2005. The company struggled for finance all those years while under BIFR. In spite of starting the project activity in June'01, the documentation could not proceed at all. It involved many complications and was very cumbersome to get the scheme through from BIFR. Moreover there was no methodology or guidelines available to develop forest based

carbon credit project. The first meeting of AR-Working Group in UNFCCC CDM was held in July, 2004 and subsequently first monitoring methodology for AR projects was issued in November, 2005.

MTPL incurred severe losses on account of plantation activity and was referred to BIFR as potentially sick company u/s 23 of Sick Industrial Companies (Special Provisions) Act (SICA) in 1990. The performance continued to deteriorate and was finally declared Sick in December 1998. Meanwhile when the company learnt about some external revenue for GHG abatement activities under Kyoto Protocol, the company thought of developing Afforestation/Reforestation CDM/carbon credit project in line with farm forestry scheme approved by NABARD. Scheme for Eucalyptus plantation on degraded land with bank finance was prepared and company's field officers approached the farmers and tribal of nearby villages with the scheme. The company then decided to take up reforestation project, after considering carbon credits benefits under Kyoto Protocol. Decision to this effect was taken by MTPL board in its meeting on 24.04.2001 to go ahead with the project, after considering carbon credits benefits under Kyoto Protocol. Incentive from planned sale of CERs was seriously considered in the decision to proceed with the project activity. The minutes of board meeting reveals that revenue from carbon credits was seriously considered for the project without which the project was not sustainable as experienced by the company in the past.

**STEP 1. Identification of alternative land use scenarios to the proposed VCS AFOLU project activity**

**Sub-step 1a. Identify credible alternative land use scenarios to the proposed VCS AFOLU project activity.**

**a) The land used for agricultural practices**

The degraded condition of the land would not support agricultural practices. The farmers would not afford the costs for preparation of land for carrying cultivation. Some of the farmers or their forefathers tried to cultivate maize, paddy etc. in past but the crop either dried or the productivity was very poor because of lack of irrigation, lack of proper upkeep and degraded nature of land. The yield was so poor compared to investment they couldn't get continue with cultivation anymore and thus the land remained barren. Marginal agriculture by few well off farmers of the area cannot be ruled out. Such farmers have developed their land for cultivation on their own. They have alternate source of income, either through some business, shop, service or professional activity whose presence has been assessed at about 12% in the PRA report that included 2% villagers also who are not the project participants. So the majority farmers included in the project activity are the poor down trodden farmers/ tribal who are not capable of investing money to develop their degraded land for agricultural purpose. Thus this alternative is not feasible.

**b) Reforestation by the farmer on their own without support of MTPL.**

The project activity has been started in the state of Odisha reckoned to be backward due to poor economic growth where 47% population reportedly struggle below poverty line 13. The land for reforestation is owned by such poor and illiterate farmers and tribal living below poverty line, most of them holding BPL card also. They do not have assured source of income to meet their daily needs including food, clothing etc. They are daily wage earners, who depend on some labour job in the area for their livelihood, sometimes they get sometime not. Few of them own some agricultural land and earn their livelihood through marginal cultivation. Soil fertility being very poor gives very poor yield resulting into very low per capita income as is evident from the PRA exercise. The PRA reveals that 96% farmers of the project activity mainly depend on cultivation (50%), daily wages (34%) and small service providers

(12%) with per capita income as low as Rs 4236/-, Rs 3533/- and Rs 3412/- respectively. Overall per capita income of the farmers is Rs 4031/- as against state's average of Rs 9897/- and national average of Rs 17823/- in 2001-02. Therefore they cannot afford to invest for reforestation where any return is expected not earlier than 5-6 years. So much so they dwell in very remote areas having no access to media and banking facilities totally unaware of schemes, incentives if any available for plantation activities. It is almost impossible for them to approach banks for loan. Even if they approach, the bank will not extend finance in absence of any means for assured return. They also lack plantation expertise for good crop and good yield. Thus this alternative is not feasible and the land has remained barren since decades. Thus this option is not valid.

c) Reforestation by the farmer with support of MTPL (not undertaken as a carbon credit project)

The lands to be reforested are heavily degraded due to continuous erosion with time which makes it unattractive for investors. The location of the project area is also remote in backward districts where lack of infrastructure; finance and proper expertise to carry out the project put major barriers. The degraded land in the state is 61.21 lakh hectares, almost 40% of the total geographical area. The cultivable land exploited for cropping is comparatively more in the coastal districts of Odisha i.e. Balasore , Bhadrak, Cuttack, Ganjam, Jajpur, Jagatasinghpur, Kendrapara, Khurda, Nayagarh, Puri etc and not in the project area i.e., Nabarangpur, Koraput and Malkangiri. It would involve huge investment for making the land suitable for plantation, managing proper infrastructure and employing experienced staff & workers to monitor the plantations regularly. The company that remained sick till November 2005 and incurring loss thereafter also, cannot afford to invest huge cost of plantation sustainably over a period of time without any external revenue. MTPL's investment in the very first year of plantation in 2001-02 was more than Rs 10 lacs. Thus this is not a very viable option because it would need private funding, which is very hard to obtain. Furthermore there are commercial risks involved in reforestation on degraded land. Because of degraded nature of land yield fluctuation and poor productivity adversely affect the ROI of the project. Uncertainty prevailed in success rate of reforestation projects, in past, in the country. In 90s many private company's raised funds from public for teak plantation with an assurance of handsome return. The plantation sites chosen were in remote areas, mostly degraded/ wasteland, that yielded poorly resulting into closure of the companies. So the financing banks feel that their lending is not effectively covered against failure to pay as such reluctant to lend for reforestation projects. The bankers of the company always excluded plantation expenses from the statement while considering working capital.

d) Continuation of present scenario

A study conducted by a NGO, Water Initiatives of Odisha (WIO), a non-profit organization says there are indications of land degradation going up at an alarming pace in the state, land desertification in many parts, especially in western and southern uplands. They are degrading from drought prone to desert prone areas. In just 13 years from 1991-92 to 2004-05, severely degraded land has increased by 136%, barren land by 69% and non-agricultural land by 34% in the state. No miracle can be expected from the farmers included in the project activity considering their economic conditions and experience, land topography, soil conditions, climatic conditions and water infrastructure in the project area. The farmers are left with no option other than to leave the land barren with little marginal farming, grazing etc. which is continuing since their forefathers. Hence continuation of present scenario is the most feasible option

that is leaving the land as barren and degraded with limited marginal cultivation & grazing. From the above discussion it was found that the present land use; characterized by degraded lands with heavy soil erosion, without natural regeneration, and grazing activity but with very low yield, is the most realistic scenario available to project participants.

### Sub-step 1b. Consistency of credible land use scenarios with enforced mandatory applicable laws and regulations

Current laws and/or regulations allow all the alternative land use scenario. Therefore, the identified alternatives are entirely in compliance with applicable legal and regulatory requirements, currently and in the foreseeable future.

The following are the list of such laws:

1. The Indian Forest Act, 1927

2. The Wildlife (Protection) Act, 1972

3. Water (Prevention and Control of Pollution) Act, 1974 with Rules

4. Forest (Conservation) Act, 1980

5. Environmental (Protection) Act, 1986

6. Noise Pollution (regulation and Control) Rules, 2000

All the above policies are taken into consideration while evaluating the alternatives to the project activity and the following alternatives listed are in compliance with the applicable laws and regulations.

| Identified Alternatives | Permitted / Not Permitted |
|---|---|
| The land used for agricultural practices. | Permitted |
| Reforestation by the farmer with support of MTPL (not undertaken as a carbon credit based A/R project). | Permitted |
| MTPL Permitted Reforestation by the farmer with support of MTPL (not undertaken as a carbon credit based A/R project). | Permitted |
| Continuation of present scenario. | Permitted |

### Step 2. Investment analysis to determine that the proposed project activity is not the most economically or financially attractive of the identified land use scenarios

### Sub-step 2a. Identify barriers that would prevent the implementation of the type of proposed project activity

The proposed project activity faces a number of investments, technological, infrastructural, institutional and social barriers to its implementation described as below:

a) Investment barriers

Project activity involves investments by MTPL well as the farmer – by MTPL for development of nursery, training and demonstration, monitoring for good growth and by the farmer for planting and maintenance of trees. Investment barrier is faced by the farmers because of huge initial investment required for reforestation with a longer gestation period. In the project activity, however, the waiting period is five years minimum being reforestation of eucalyptus, a fast growing species. The land under project activity is owned by poor farmers, tribal, daily wage earners who do not have capital to invest. They own small parcels of land. As per the land ownership structure (Figure A.2.2), 64% farmers own land 3 acre or less and 28% between 3 to 5 acres, ie the land holding of the majority 92% is 5 acres or less. Among remaining 8%, merely 1% hold land more than 10acres. The PRA study reveals that 96% farmers of the project activity mainly depend on cultivation (50%), daily wages (34%) and small service providers (12%) with per capita income as low as Rs 4236/-, Rs 3533/- and Rs 3412/- respectively. Overall per capita income of the farmers is Rs 4031/- as against state's average of Rs 9897/- in Odisha, Rs 12032/- in Chhatishgarh and Rs 17932/- in Andhra Pradesh in 2001-02. Evidently their economic condition do not allow them to afford high establishment cost in the early stage of plantation and to wait for wood harvesting income that will come only after 5-6 years, in best scenarios. All incomes from timber, and CERs, were envisaged to occur five years after the start of the project activity. High initial investment without quick return is beyond the means of the land owners. Farmers participating in reforestation have little opportunity for debt funding, banks tend to be reluctant to lend to those living at the subsistence level because they have few assets for collateral and little disposable income available for debt service. According to the International Fund for Agricultural Development (IFAD), "more than one billion people – 90 per cent of the world's self-employed poor – lack access to basic financial services, depriving them of the means to improve their incomes, secure their existence, and cope with emergencies".

b) Technological barriers:

The tribal farmers in the region do not have access to quality seed sources and lack skills for producing high quality seedlings. They also lack expertise for successful tree planting. They are far poorly educated to have access to information and knowledge that will help them achieve any benefit from the land that they own. MTPL encourages the farmers and provides technical support for the plantation activity free of cost. Technological barriers faced by the farmers are established as per section 7 of PRA report (Page 18) submitted by Maa Syamalay Voluntary organisation, NGO of the area who conducted PRA for the project. c) Barriers due to local ecological conditions: The reforestation sites are all degraded land since decades as is evident from Landsat TM 1990 satellite imagery of the parcels. Land remained barren with no vegetation cover causing undesired compactness of soil. Due to direct exposure to wind and water erosion, topsoil is almost eroded. Unfavourable metrological conditions like frequent drought in the region are not allowing agriculture to flourish in the area of project activity. The topography of land is undulated, soil is rocky, deficient in necessary nutrients making the land unfit for agriculture uses. d) Barriers due to social conditions: The barriers due to social conditions are identified as under: Lack of skill and proper training: The technical know-how and skill for eucalyptus plantation on commercial scale to get viable

yield is lacked with most of the farmers as most of them are illiterate. There is no mechanism for training and demonstration on good planting, manuring, harvesting, and soil conservation techniques available in the area. Lack of organisation: Planting large plantations requires more than a single individual. The local communities lack the organisational structure to put together a volunteer effort to plant trees. This statement is supported by the fact that India has had a National Forestry Policy in effect since 1988 to address the problem of deforestation but is still seeing annual losses in forest cover. MTPL provide the organisational structure, necessary to overcome this barrier. MTPL provides the training and provides the necessary manpower and support. e) Barriers relating to market and transportation: The reforestation sites are mostly in remote areas where road connectivity is poor, roads are undeveloped putting major barrier in transportation of harvested crop. Timber has to be dragged to road at many sites lacking road approach, incurring additional charges for dragging that grind the profitability of timber. Institutional transporters, owing to perceived risks, in general, are reluctant to operate in remote areas which is evident from various correspondences with transporters. Letters from two transporters - Odisha Bengal Carrier Ltd, Kolkata and Dilip Kumar Tripathy, Nabarangpur showing their reluctance are a few examples. So the company has to depend on local vehicle owners, so the company has to depend on local vehicle owners. The farmers too face difficulty in getting market and transport for their crop; they fully depend on the company which is evident from various correspondences from the farmers. Letter from farmers of Nandpur and Padwa bank areas of Koraput district, dated 10.06.02 written in this regard is one example. Besides, in absence of institutional arrangements to assure market and prices for produce, the farmers are hesitant to dedicate their land for farm forestry. Study report “Sustainable land & forest regeneration” by Indira Gandhi Institute of Development Research refers experiences in Haryana and Gujarat where eucalyptus plantation initially increased but declined with decrease in price25.

**Sub-step 2b: Elimination of land use scenarios that are prevented by the identified barriers.**

| S. No. | Alternatives | How identified barriers prevent implementation of credible alternatives identified at step 1a. | Prevented /Not prevented by barrier |
|---|---|---|---|
| a | The land used for agricultural practices | 1. Investment barrier: The land owners in the project activity are poor farmers/ tribal/ daily wage earners who would neither afford the cost of land preparation for agricultural practices on their own nor can get bank finance due to lack of guaranteed return. Hence stated alternative faces the investment barrier. | Prevented by the barrier |
| | | 2. Technological Barrier: The required skill and know-how for this alternative is lacked with most of the farmers except the practices in vogue and whatever they have learnt from their forefathers. Few tried agriculture but either failed or stopped due to poor yield. Hence it also faces this barrier to some extent. | Prevented to some extent |

| | | | |
|---|---|---|---|
| | | 3. Barriers due to local ecological conditions: Due to the degraded nature of land, eroded top soil, undulated topography, rocky soil deficient in necessary nutrients, absence of water resources and unfavourable metrological conditions like frequent drought in the region has made the land unfit for agriculture uses. Soil reclamation for agriculture purposes is very difficult and costly affair, if not impossible. Land productivity is very poor. Few tried agriculture but either failed completely or stopped due to poor yield. Hence the alternative faces major ecological barrier. | Prevented by the barrier |
| b | Reforestation by the farmer on their own without support of MTPL | 1. Investment barrier: The stated alternative faces major investment barrier by the farmers. They are mostly small land owners, 92% holding 5 acre or less among which 64% even less than 3 acres that indicates their poor economic condition (Figure A.2.2 at page 3). Eucalyptus plantation costs Rs 8388/- per acre to establish. Per capita income of the farmers of the project activity as revealed from PRA study is Rs 4031/- much below even the states's average of Rs 9897/- in Odisha, Rs 12032/- in Chhatishgarh and Rs 17932/- in Andhra Pradesh in 2001-02 12 which is significantly low and indicates the degree of deprivation. So the farmers lack capital, their economic condition would not allow them to invest for reforestation where any return is expected not earlier than 5-6 years. So much so they are not easily accessible to bank for finance. Even they approach, the banks are reluctant to extend loan in absence of assured means of return. Hence stated alternative faces major investment barrier. | Prevented by the barrier |
| | | 2. Technological Barrier: Lack of access to necessary materials: The farmers are not aware of development of good quality seedlings, good planting practices, required quality of manure & fertilizer and their application procedure. Therefore, implementation of this alternative is not possible with the barrier stated. | Prevented by the barrier. |
| | | 3. Barriers due to local ecological conditions: Due to degraded nature of land, top soil erosion, undesired compactness of soil, deficiency of necessary nutrients, rocky soil and unfavourable metrological conditions like frequent drought the productivity of land is | Prevented by the barrier. |

| | | | |
|---|---|---|---|
| | | adversely affected that puts a major threat to implementation of project activity. | |
| | | 4. Social Barrier:<br><br>Lack of skill and proper training: The technical know-how and skill for eucalyptus plantation on commercial scale to get viable yield is lacked with most of the farmers as most of them are illiterate. There is no mechanism for training and demonstration on good planting, manuring, harvesting, and soil conservation techniques available in the area.<br><br>Lack of organisation: The alternative also faces lack of organisation for collective reforestation which is very much essential for assured transportation and sale of produce. In the event of piece meal plantation, transportation and market both will be difficult for the farmers, as mostly residing in remote areas. The farmers would not be able to encash the crop resulting into major barrier. | Prevented by the barrier. |
| | | 5. Barriers relating to market and transportation: The farmers are residing in remote areas, their reforestation sites are also in remote areas which has poor road connectivity, no road connectivity and undeveloped roads putting major barrier in transportation of harvested crop. It's difficult for them to get transporters as well as market for their piece meal plantation in remote areas. The farmers are not able to get market and transport for their crop, they fully depend on the company which is evident from various correspondences from the farmers addressed to company. letter from farmers of Nandpur and Padwa bank areas of Koraput district, dated 10.06.02 written in this regard is one example. Besides, in absence of institutional arrangements to assure market and prices for produce, the farmers are hesitant to dedicate their land for farm forestry. Study report by Indira Gandhi Institute of development Research refers experiences in Haryana and Gujarat where eucalyptus plantation declined with decrease in price. | Prevented by the barrier. |
| c | Reforestation by the farmer with support of MTPL (not undertaken as a carbon credit based A/R project) | 1. Investment Barrier: MTPL's investment in the very first year of plantation in 2001-02 was more than Rs. 10 lacs. The company that remained sick till November 2005 and incurring loss thereafter also, cannot afford to invest huge cost of plantation sustainably over | Prevented by this barrier |

| | | | |
|---|---|---|---|
| | | a period of time without any external revenue. Thus this is not a very viable option because it would need private funding, which is very hard to obtain. | |
| | | 2. Technological Barrier: Lack of access to necessary materials: This barrier is supplemented by MTPL by providing quality seedlings, replacement of moratorium, manure & fertilizer and their application procedure. | Not prevented by the barrier |
| | | 3. Barriers due to local ecological conditions: Due to degraded nature of land, top soil erosion, undesired compactness of soil, deficiency of necessary nutrients, rocky soil and unfavourable metrological conditions like frequent drought the productivity of land is adversely affected that puts a major threat to implementation of project activity. | Not prevented by the barrier |
| | | 4. Social Barrier: Lack of proper skill and training: MTPL provides technical support to develop required know how and skill for good planting practices for commercial plantation of eucalyptus to get viable yield. The field officers arrange training and demonstration sessions on good planting, manuring, harvesting, and soil conservation techniques at a common place convenient to the farmers in their villages. Sometimes these sessions are conducted at factory also, if deemed necessary.<br><br>Lack of organisation: This barrier is supplemented by MTPL with their organisational set up. The field officers encourage the farmers for collective plantation. A farmer gets motivated with the work of other farmers and thus no multiplies. This helps them to get assured transportation and market thus realising their harvest without any hassle. | Not prevented by the barrier |
| | | 5. Barriers relating to market and transportation: The reforestation sites are mostly in remote areas where road connectivity is poor, roads are undeveloped putting major barrier in transportation of harvested crop. Timber has to be dragged to road side at many sites lacking road approach, incurring additional charges for dragging that grind the profitability of timber. Institutional transporters, owing to perceived risks, in general, are reluctant to operate in remote | Prevented by the barrier to some extent. |

| | | | |
|---|---|---|---|
| | | areas which are evident from various correspondences from the transporters. Letters from transporters - Odisha Bengal Carrier Ltd, Kolkata and Dilip Kumar Tripathy, Nabarangpur showing their reluctance are a few example. So the company has to depend on local vehicle owners. | |
| d | Continuation of present scenario | This alternative does not face any of the identified barriers. | Not prevented by any of the barriers |

The alternative land use scenario identified in sub-step 1a above can be eliminated from baseline scenarios due to barriers faced. The alternative land use continuation of present land use scenario i.e. status as degraded land does not face the above-mentioned barriers. Sub-step 2c. Determination of baseline scenario (if allowed by the barrier analysis) Is afforestation without being registered as an A/R carbon credit project activity included in the list of land use scenarios that are not prevented by any barrier? → no, then: Does the list contain only one land use scenario? → yes, the remaining land use is the baseline scenario. The alternative, leaving the land without any change in land use (continued status as degraded land) does, of course, not face any of the above-mentioned barriers.

STEP 3. Barriers analysis

The role of MTPL is like a facilitator. The company creates awareness and encourages farmers for reforestation, provides technical assistance, nursery facility, arrange finance from bank, monitors harvesting & coppicing etc. which requires huge expenditure on account of salary & wages of work force, conveyance, trainings & meetings etc.

Sub-step 3a. Determine appropriate analysis method

As per the tripartite agreement entered between the company, bank and the farmers, the company provides buy back guarantee for timber proceeds at market price prevailing at the time of harvest. So the company does not get any price preference. The only return the company does get is securing raw material for its factory. The project activity therefore does not generate any financial or economic benefits other than carbon credit revenues hence Option I: Simple cost analysis is applied for investment analysis. The relevant article 1.6 of the tripartite agreement signed with the farmers in the year 2001 is reproduced as below: “The user industry agrees to pay to the bank to the farmer’s credit the proceeds of the sale of timber received at a minimum rate of Rs 1000/- per MT of Hardwood including bark delivered at mill or according to the prevailing market rate whichever is higher at the time of harvest. The rate will be decided and determined by a committee consisting of Bank, representative of Industry and the farmers.” Sub-step 3b. Option I: Apply simple cost analysis When MTPL learnt about external revenue for reforestation activities under Kyoto Protocol the company decided to develop A/R carbon credit project in line with farm forestry scheme. The company started plantation activity in 2001-02 and engaged 14 dedicated personnel for giving technical demonstration & consultation, visiting farmers, organising meetings with them to propel FFS and motivate their participation, organising training for them and monitoring the plantation activity in the degraded land. The company incurred direct expenses of more than Rs 10 lacs in the very first year of plantation, without any return, as computed in the table below:

| Direct Expenses on Plantation activity by MTPL (Year 2001-02) | | |
|---|---|---|
| S. No. | Expense account head | Total Cost in 2001-02 (Rs) |
| 1 | Salary & Wages | 769212 |
| 2 | Two wheeler expenses | 21040 |
| 3 | Staff conveyance | 62484 |
| 4 | Vehicle hiring expenses | 190682 |
| | Total: | 1043418.4 |

The above expenses are direct expenses computed conservatively for plantation activity based on company's book of accounts of 2001-02 which are likely to increase every year due to inflation as well as increase in planted area.

The company provides the above services free of charge as stipulated in Article 1.3 of the tripartite agreement without which the project would have not happened. Article 1.3 of the agreement reproduced below:

"The industry agrees to provide technical guidance, assistance and services relating to planting and maintenance of such plantation till they are harvested, and also agrees to undertake the supervisory work in implementing the scheme for Eucalyptus plantation in the farmers' field. However it is specifically understood and agreed by the parties that the industry will not be liable for any damage or loss sustained by the farmers on account of failure of crops wholly or partially or low yield or for any other losses for any reason whatsoever." Therefore it is evident that the project activity does not generate any financial or economic benefit for the company except the= carbon credit related revenue. MTPL, being a loss making company, cannot bear sustainably the huge operation and maintenance cost of plantation as above without any external revenue. Thus investment in such a project, which is prone to so many risks, was a tough decision to take. On the other hand, the continuation of the current scenario would not need any reforestation activity on the degraded land and does not involve any additional costs.

STEP 4. Common practice analysis

With the growth of forestry based industries in the region there has been some reforestation currently underway but they essentially differ from the project activity at least in three ways. The two paper industries in the region – Sewa unit of Ballarpur Industries Ltd (BILT) near Jeypore in Koraput district and JK Paper in Raygada district neighbouring Koraput also require timber as raw material for manufacturing paper. They have also initiated reforestation in the region. JK Paper is conducting this activity as a ARR carbon credit project. BILT is engaged in reforestation activity through its subsidiary unit BILT Tree Tech Ltd but widely differs from the scheme adopted in the project activity. The "Report on similar Reforestation activities in the area" by the NGO engaged for conducting PRA provides relevant information on reforestation by BILT.

BILT, Sewa unit started reforestation in the area in 1995-96 through lease plantation in Boipariguda & Boriguma bank areas of Koraput district on SC/ST land which got subjudice and the company had to return the entire land to their owners. The company then started selling seedlings on direct sale basis to interested farmers who were economically well off or those capable of arranging finance of their own. The company does not facilitate or initiate to arrange finance to the farmers for plantation activity, a few big farmers have been named in the report who neither required nor availed bank finance. As a result only few well off farmers/communities or SHGs capable of investing on plantation are benefited and have gone for reforestation. The company at their units at Ballarpur in Maharashtra and Kamalapuram in Andhra Pradesh has been conducting reforestation with bank finance and very recently, FFS with bank finance started at Sewa unit also.

Whereas the farmers under the project activity are small farmers, 60% owning land ≤ 3 acres, 32% between 3-5 acres, 7% between 5-10 acres and only 1% above 10 acres. They are economically weak with average annual per capita income of Rs 4031/-, not capable of plantation on their own and reside in remote areas. MTPL officials proactively approach them and encourage them for reforestation on their degraded land with financial assistance by local banks. They educate them on farm forestry scheme, availability of bank finance and technical assistance to involve them for reforestation. The land category for reforestation in the project activity is essentially chosen to be degraded land ensuring bank finance. Consequently the project activity has been able to benefit small & poor farmers/tribal at such a large scale, numbering 12000 plus farmers.

Based on above the essential distinctions are summarised as under:

1. BILT is primarily selling seedlings/clones on direct sale basis to economically well off farmers who are capable of investing and growing trees of their own without bank finance and tripartite agreement.

2. Due to non-availability of bank finance small & marginal land owners in remote areas may not participate in such plantation activity.

3. Thirdly the company targets to plant short-rotation and fast growing species in accessible areas rather than planting degraded land in remote areas which is not economically attractive due to low land productivity and high transportation cost.

4. Reforestation with bank finance under FFS is practiced in BILT's other units at Ballarpur (Maharashtra) and Kamalapuram (AP) while at Sewa unit this scheme is at its infant stage.

5. There is no requirement for land being degraded. Land for reforestation may or may not be degraded land, may be agricultural land also which is evident from their tripartite agreement. In MTPL's scheme land for reforestation have to be degraded land. Under farm forestry scheme approved by NABARD the bank finance is available only for reforestation on degraded land and not on agricultural land.

With establishment of above essential distinctions between the project activity and similar reforestation activities, the proposed ARR AFOLU project activity is not the baseline scenario and, hence, it is additional. This also complements the above barrier as well as investment analysis, which indicates that

reforestation, is economically unattractive in the absence of proposed ARR AFOLU project activity, due to poor economic condition of the farmers, low land productivity and high transportation costs.

**Land regeneration programmes:**

Recent study "Assessment of large-scale deforestation of Nawarangpur district, Odisha, India: a remote sensing based study" conducted by the scientists C Sudhakar Reddy, K Ram Mohan Rao, Chiranjibi Pattanaik & P K joshi of SACON, a Remote Sensing organisation states that there has been increase in deforestation in the district, deforestation rate 3.62 assessed for the period from 1973 to 1990 has increased to 3.97 during 1990 to 2004. http://www.springerlink.com/content/f13257052uwv2471/fulltext.pdf?page=1

With the carbon benefit, reforestation on degraded lands becomes economically acceptable. This creates an incentive to project participants to do the necessary documentation for bank loan on behalf of poor tribal/farmers for reforestation on degraded lands. In turn this provides more ecological benefits such as conservation of biodiversity and soil erosion control. This will contribute to the goal of increasing forest resources, as well as the carbon dioxide sequestration and general ecological environment improvement.

## 3.6 Methodology Deviations

There is no deviation from the methodology.

# 4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

## 4.1 Baseline Emissions

Please Refer to CDM PDD - Project 5016 : Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 4.2 Project Emissions

Please Refer to CDM PDD - Project 5016 : Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 4.3 Leakage

Please Refer to CDM PDD - Project 5016 : Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

## 4.4 Estimated Net GHG Emission Reductions and Removals

Please Refer to CDM PDD - Project 5016 : Reforestation of degraded land by MTPL in India CDM: Reforestation of degraded land by MTPL in India (unfccc.int))

# 5 MONITORING

## 5.1 Data and Parameters Available at Validation

| | |
|---|---|
| **1. Data/Parameter** | Number of Permanent Sample plots (PSPs) |
| **Unit** | Number |
| **Description** | Sample plots are chosen randomly from each stratum who represent the reforestation of respective stratum. All the project monitoring activity is based on the PSPs. |
| **Source of data** | Sample Plot Register |
| **Value(s) applied** | 48 |
| **Choice of data or measurement methods and procedures** | Number of PSPs calculated using methodological tool "Calculation of number of sample plots for measurements within A/R CDM project activities, Version 02.1.0. |
| **Purpose of data/parameter** | Project removal of GHG emission. |
| **Additional comments** | 48 PSPs calculated as per tool but monitored 244 as explained in section C to be more precise. |
| **Data / Parameter** | Number of Permanent Sample plots (PSPs) |

| | |
|---|---|
| **2. Data/Parameter** | Sample plot ID |
| **Unit** | Alpha Numeric |
| **Description** | Sample plot ID |

| | |
|---|---|
| **Source of data** | Sample plot register |
| **Value(s) applied** | Numeric series ID has been assigned to each permanent sample plot. |
| **Choice of data** | |
| or measurement methods and procedures | Numeric series ID has been assigned to each permanent sample plot. |
| Purpose of data/parameter | Project removal of GHG emission. |

| | |
|---|---|
| **3. Data/Parameter** | Confidence Level |
| **Unit** | % |
| **Description** | Confidence Level |
| **Source of data** | - |
| **Value(s) applied** | 95 (The value specified in the methodology AR ACM0001 version 04) |
| **Choice of data** | |
| or measurement methods and procedures | The value specified in the methodology AR ACM0001 version 04. |
| Purpose of data/parameter | Calculation of number of PSPs |

| | |
|---|---|
| **4. Data/Parameter** | $t_{VAL}$ |
| **Unit** | Dimension less |
| **Description** | Two-sided Student's t-value, at infinite degrees of freedom in the first iteration and at degrees of freedom equal to (n-1) in |

| | |
|---|---|
| | subsequent iterations, for the required confidence level; dimensionless |
| **Source of data** | Student's t-distribution table given in the tool for calculation of number of PSPs. |
| **Value(s) applied** | 1.960 |
| **Choice of data** or measurement methods and procedures | Default value |
| Purpose of data/parameter | Calculation of number of PSPs |

| | |
|---|---|
| **5. Data/Parameter** | Standard Deviation of each stratum |
| **Unit** | Dimensionless |
| **Description** | Standard deviation of each stratum |
| **Source of data** | - |
| **Value(s) applied** | 30 |
| **Choice of data** or measurement methods and procedures | |
| Purpose of data/parameter | Calculation of number of PSPs |

| | |
|---|---|
| **6. Data/Parameter** | Biomass Expansion Factor (BEF) |
| **Unit** | Dimensionless |
| **Description** | Biomass Expansion Factor |

| | |
|---|---|
| **Source of data** | IPCC GPG for LULUCF Table- 3A.1.10 |
| **Value(s) applied** | 2 |
| **Choice of data** or measurement methods and procedures | Default value |
| Purpose of data/parameter | Project removal of GHG emission |

| | |
|---|---|
| **7. Data/Parameter** | Carbon Fraction (CF) |
| **Unit** | tC tdm-1 |
| **Description** | Carbon Fraction |
| **Source of data** | IPCC GPG LULUCF |
| **Value(s) applied** | 0.5 |
| **Choice of data** or measurement methods and procedures | IPCC default value |
| Purpose of data/parameter | Project removal of GHG emission |

| | |
|---|---|
| **8. Data/Parameter** | Root to Shoot Ratio (R) |
| **Unit** | Dimensionless |
| **Description** | Root to Shoot Ratio |
| **Source of data** | IPCC GPG LULUCF Table- 3A.1.8 |
| **Value(s) applied** | 0.27 |

| | |
|---|---|
| **Choice of data** or measurement methods and procedures | Default value |
| Purpose of data/parameter | Project removal of GHG emission |

## 5.2 Data and Parameters Monitored

| | |
|---|---|
| **1. Data / Parameter** | Ai |
| **Data unit** | ha |
| **Description** | Area of stratum i |
| **Source of data** | GIS data |
| **Description of measurement methods and procedures applied** | GIS measurement |
| **Frequency of monitoring/recording** | At the start of the project activity and adjusted thereafter every five years. |
| **Value applied:** | Project stratification is based on year of plantation. Strata wise total area as per 2011 measurement using GIS technique is given the table below: |
| **Monitoring equipment** | GPS Machines – eTrex Vista (Garmin) |
| **QA/QC procedures applied** | Review of measured data |

| Strata no | Year of Plantation | GIS Area 2011 (ha) |
|---|---|---|
| Strata 1 | 2001 | 473.29 |
| Strata 2 | 2002 | 931.04 |
| Strata 3 | 2003 | 1195.85 |
| Strata 4 | 2004 | 2150.64 |
| Strata 5 | 2005 | 2961.32 |
| Strata 6 | 2006 | 3304.89 |
| Strata 7 | 2007 | 3510.24 |

| | |
|---|---|
| **Purpose of data** | Project GHG removal |
| **Calculation method** | N.A. |
| **Comments** | N.A. |

| | |
|---|---|
| **2. Data / Parameter** | Area of all sample plots in stratum i (Asp i) |
| **Data unit** | ha |
| **Description** | As per registered PDD the size of PSPs remain constant as 0.04 ha for all strata. An area of 20m x 20m size (measuring 0.04 ha) is measured and marked within each sample parcel in the direction mentioned in sample plot register |
| **Source of data** | Measured |
| **Description of measurement methods and procedures applied** | Field measurement. |
| **Frequency of monitoring/recording** | Five years |
| **Value applied:** | Total area of PSPs in each stratum is given in the table below: |

| S. No. | Re-strata No | Age | No of PSPs | Area @ 0.04 ha per PSP |
|---|---|---|---|---|
| 1 | RS01 | 2nd Cop- 4th Yea | 1 | 0.04 |
| 2 | RS02 | 2nd Cop- 3rd Year | 1 | 0.04 |
| 3 | RS03 | 2nd Cop- 2nd Year | 1 | 0.04 |
| 4 | RS04 | 2nd Cop- 1st Year | 1 | 0.04 |

| | | | | | |
|---|---|---|---|---|---|
| | 5 | RS05 | 2nd Cop- 0th Year | 0 | 0 |
| | 6 | RS06 | 1st Cop- 6th Year | 1 | 0.04 |
| | 7 | RS07 | 1st Cop- 5th Year | 2 | 0.08 |
| | 8 | RS08 | 1st Cop- 4th Year | 2 | 0.08 |
| | 9 | RS09 | 1st Cop- 3rd Year | 2 | 0.08 |
| | 10 | RS10 | 1st Cop- 2nd Year | 1 | 0.04 |
| | 11 | RS11 | 1st Cop- 1st Year | 1 | 0.04 |
| | 12 | RS12 | 1st Cop- 0th Year | 0 | 0 |
| | 13 | RS13 | Original- 8th yr | 1 | 0.04 |
| | 14 | RS14 | Original- 7th yr | 2 | 0.08 |
| | 15 | RS15 | Original- 6th yr | 6 | 0.24 |
| | 16 | RS16 | Original- 5th yr | 16 | 0.64 |
| | 17 | RS17 | Original- 4th y | 10 | 0.4 |
| | | | Total | 48 | 1.92 |
| Monitoring equipment | Type: Measuring Tape ID no: MT/ST/01 Calibration frequency – Annually, Date of last calibration: 15.10.2011, Validity – One year till 14.10.2012, | | | | |
| QA/QC procedures applied | Review of measured data carried out by CDM Manager as and when data are collected. | | | | |

| | |
|---|---|
| Purpose of data | • Project removal |
| Calculation method | Where relevant, provide the calculation method, including any equations, used to establish the data/parameter. |
| Comments | Provide any additional comments |

| | |
|---|---|
| 3. Data / Parameter | Diameter at breast height (DBH) |
| Data unit | cm |
| Description | Diameter of 100% tree at breast height (DBH) contained in each PSP is measured using steel scale and outside calliper and recorded. Measurement is taken at standard breast height of 1.37m and not at individual's breast height for which a stick with 1.37m marking is used. |
| Source of data | Measured |
| Description of measurement methods and procedures applied | Field measurement |
| Frequency of monitoring/recording | Five years |
| Value applied: | For values refer to Measurement Sheets contained in Project Removal Calculation. |
| Monitoring equipment | Type: Steel scale – 30 cm, ID no: MTPL/SS-01 Calibration frequency: Annually, Last calibration: 30.01.12, Validity: One year till 30.01.13, |
| QA/QC procedures applied | PSP Measurement Process (Procedure no: FFS-P-04), Clause no 5.2 Procedure for measuring DBH |

| | |
|---|---|
| Purpose of data | Project removals |
| Calculation method | Not applicable |
| Comments | |

| | |
|---|---|
| 4. Data / Parameter | Tree height (H) |
| Data unit | m |
| Description | Top Tree height of 100% trees contained in each PSP is measured using Abney's Level (Angle Level) and measuring tape. However shorter trees upto 2m height are measured directly with measuring tape. |
| Source of data | Measured |
| Description of measurement methods and procedures applied | Field measurement |
| Frequency of monitoring/recording | Five years |
| Value applied: | For values refer to Measurement Sheets contained in Project Removal Calculation. |
| Monitoring equipment | 1. Type: Angle Level (Abney's Level) ID no: MT/AL-01 Calibration frequency – Annually, Date of last calibration: 16.04.2011, Validity – One year till 15.04.2012, 2. Type: Measuring Tape ID no: MT/ST/01 Calibration frequency – Annually, Date of last calibration: 15.10.2011, Validity – One year till 14.10.2012, |
| QA/QC procedures applied | PSP Measurement Process ( Procedure no: FFS-P-04), Clause no 5.1 Procedure for measuring tree height |

| | |
|---|---|
| Purpose of data | Project removals |
| Calculation method | Method of calculation is given in PSP Measurement Process (Procedure no: FFS-P-04). |
| Comments | |

| | |
|---|---|
| 5. Data / Parameter | Years of monitoring activity (t2 and t1) |
| Data unit | Year |
| Description | Years of the monitoring activity |
| Source of data | Default |
| Description of measurement methods and procedures applied | Default data |
| Frequency of monitoring/recording | Five years |
| Value applied: | 2006 and 2011 |
| Monitoring equipment | N/A |
| QA/QC procedures applied | n/a |
| Purpose of data | Project removals |
| Calculation method | N/A |
| Comments | |

| | |
|---|---|
| 6. Data / Parameter | Land title |
| Data unit | N/A |
| Description | Land ownership of the farmers is ensured through availability of Land Patta or Passbook in respect of individual farmers at the time of each monitoring. |
| Source of data | Document: Land Patta/ Passbook |
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Five years |
| Value applied: | Provide an estimated value for the data/parameter |
| Monitoring equipment | Identify equipment used to monitor the data/parameter including type, accuracy class, and serial number of equipment, as appropriate. |
| QA/QC procedures applied | Review of measured data is carried out by Manager (Plantation) |
| Purpose of data | Land title ownership |
| Calculation method | NA |
| Comments | Results of patta verification is evidenced in “List of Participating Farmers” and “Declaration by MTPL”. |

| | |
|---|---|
| 7. Data / Parameter | Carbon Right |
| Data unit | - |
| Description | Availability of “Authorization of farmers for claiming Carbon Credit” from individual farmer is ensured at the time of each monitoring. |
| Source of data | Individual farmer |

| | |
|---|---|
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Five years |
| Value applied: | Provide an estimated value for the data/parameter |
| Monitoring equipment | Identify equipment used to monitor the data/parameter including type, accuracy class, and serial number of equipment, as appropriate. |
| QA/QC procedures applied | Review of measured data is carried out by Manager (Plantation) |
| Purpose of data | Carbon right ownership |
| Calculation method | NA. |
| Comments | Results of verification is evidenced in “List of Participating Farmers” and “Declaration by MTPL” |

| | |
|---|---|
| 8. Data / Parameter | Available Grazing Land (AGL) |
| Data unit | Acre |
| Description | Land available for grazing under the control of PP |
| Source of data | Survey in 2006 and 2011 by Maa Samalyi Voluntary Organization |
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Five years |
| Value applied: | Available grazing land under the control of PP is 2840.30 acres as against the required area of 2673.38 acres as per current survey of 2011. |

| | |
|---|---|
| Monitoring equipment | NA. |
| QA/QC procedures applied | NA |
| Purpose of data | Leakage calculation |
| Calculation method | NA. |
| Comments | |

| | |
|---|---|
| 9. Data / Parameter | No of existing animals (HExisting,g,k,t) |
| Data unit | Head |
| Description | Number of head of animal type g existing on parcel k and / or being fed by fodder produced on parcel k before displacement of animals in year t |
| Source of data | Survey in 2006 and 2011 by Maa Samalyi Voluntary Organization |
| Description of measurement methods and procedures applied | Estimated in displacement plan and monitored |
| Frequency of monitoring/recording | Five years |
| Value applied: | Animals within project boundary as per 2011 report: Cows/ Bufallos = 756 nos Goats = 696 nos |
| Monitoring equipment | NA. |
| QA/QC procedures applied | NA |
| Purpose of data | Leakage calculation |

| | |
|---|---|
| Calculation method | NA. |
| Comments | |

| | |
|---|---|
| 10. Data / Parameter | No of displaced animals (H g,k,t) |
| Data unit | Head |
| Description | Number of head of animal type g displaced and/or the number of animals of type g fed by fodder for which production is displaced to parcel k in year t. |
| Source of data | Survey in 2006 and 2011 by Maa Samalyi Voluntary Organization |
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Five years |
| Value applied: | Animals displaced as per 2011 report: Cows/ Bufallos = 2062 nos Goats = 3374 nos |
| Monitoring equipment | NA. |
| QA/QC procedures applied | NA |
| Purpose of data | Leakage calculation |
| Calculation method | NA. |
| Comments | |

| | |
|---|---|
| 11. Data / Parameter | Biomass Burning (E BiomassBurn,t) |
| Data unit | t C/yr |
| Description | Loss of above ground biomass carbon due to biomass burning |

| | |
|---|---|
| Source of data | Survey in 2006 and 2011 by Maa Samalyi Voluntary Organizatio |
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Five years |
| Value applied: | NA |
| Monitoring equipment | NA. |
| QA/QC procedures applied | NA |
| Purpose of data | Leakage calculation |
| Calculation method | ER Sheet |
| Comments | For project removal calculation. |

| | |
|---|---|
| 12. Data / Parameter | Survival Rate |
| Data unit | % |
| Description | Number of trees counted in each sample parcel initially after 3 months of planting and survival rate is computed. Replantation done where survival is < 90%. Final survival checking is done after 3 years of planting for plantation management. At the time of monitoring number of trees contained in each PSP are counted manually and recorded. In case of harvested parcels, number of coppices in each tree are also counted and recorded. |
| Source of data | Field measurement |
| Description of measurement methods and procedures applied | NA |
| Frequency of monitoring/recording | Initial survival checking after 3 months of planting. Final survival checking after 3 years of planting and subsequently at each monitoring event. |

| | |
|---|---|
| Value applied: | For values refer to Sample Plot Register and Measurement Sheets contained in Project Removal. |
| Monitoring equipment | NA. |
| QA/QC procedures applied | NA |
| Purpose of data | Leakage calculation |
| Calculation method | (No of trees available / No of trees planted) x 100% |
| Comments | For project removal calculation. |

## 5.3 Monitoring Plan

During the project development the size and the location of the project area were negotiated with the villages and the figures on size are subject to the contractual arrangements. The sites were identified and delineated using topographic maps of 1:25000.

To ensure that the planting quality conforms to the practice described in Project Description Document (PDD) and is well implemented, the following monitoring activities shall be conducted in the first three years after planting:

☐ Field survey of the boundary of the areas with actual tree planting, site by site.

☐ Measuring geographical positions (latitude and longitude) using GPS.

☐ The project boundary, and the integrity of the planted area, will be monitored periodically through the crediting period.

☐ Confirm that site and soil preparations are implemented based on practice documented in PDD.

☐ Survival checking:

1) The initial survival rate of planted trees shall be counted three months after the planting, and re-planting shall be conducted if the survival rate is lower than 90 percent of the final planting density.

2) Final checking three years after the planting;

3) The checking of the survival rate may be conducted using permanent sample plots.

☐ Weeding checking: check and confirm that the weeding practice is implemented as described in the PDD;

☐ Survey and check that species and planting for each stratum are in line with the PDD;

☐ Document and justify any deviation from the planned forest establishment.

Monitoring of Forest Management

Forest management practices are important drivers of the GHG balance of the project, and thus must be monitored. Practices to be monitored include: ☐ Cleaning and site preparation measures: date, location, area, biomass removed and other measures undertaken; ☐ Planting: date, location, area, tree species (establishment of the stand models); ☐ Fertilization: date, location, area, tree species, amount and type of fertilizer applied, etc; ☐ Harvesting: date, location, area, tree species, volumes or biomass removed; ☐ Coppicing: date, location, area, check and confirm that the site operation practices are implemented as described in the PDD; ☐ Monitoring of disturbances: date, location, area (GPS coordinates and remote sensing as applicable), tree species, type of disturbance, biomass lost, implemented corrective measures, change in the boundary of strata and stands.

Collecting reliable field data is an important step in quality assurance. The personnel involved in the project monitoring and in the measurement of carbon pools should be fully trained in data collection and analysis. The data collection and organization is based on the standard operating procedures (SOPs) developed for the purpose.

These SOPs contain provisions for documentation and verification so that continuity in the field monitoring is maintained and measurements can be verified. In order to ensure consistency in field monitoring and measurements, the team members shall be made aware of all procedures of data collection. It is recommended that test plots be used to develop SOPs. The monitoring and data collection documents should list names of all personnel and their responsibilities. The quality of field data collection shall be verified by undertaking random checks of the plots, including their re-measurement by a senior member of the monitoring team.

Quality assurance (QA) activities and processes ensure that monitoring data meet the requirements Quality Control (QC) procedures verify the data and reporting requirements for analytical data used in support of assessment. The project activity has developed and implemented procedures of guarantee and control of quality (QA/QC) in order to guarantee that the gathered data are of acceptable, sustainable quality, and that the appropriate office procedures are followed.

QA/QC for field measurements

Collecting reliable field measurements is an important step in the quality assurance plan. New staff will be adequately trained. Training courses on field data collection and data analyses will be held for all staff involved in the field measurement work. The training courses should ensure that each task team member is fully aware of all procedures and the importance of collecting data as accurately as requested. To achieve this, both classroom examination and field

examination will be conducted, and only those who pass the required examination can join the task team.

The SOPs include auditing procedures. The first type of audit, a 'hot check', consisting of the project leader observing field crew members during data collection to ensure field measurements SOPs shall be followed to correct any technique errors. The second type of audit, a 'blind check', to quantify measurement errors, shall consist of a complete re-measurement of 10% of plots by verifying teams highly experienced in forest measurement and attentive to detail. After measurement a comparison will be made with the original data and discrepancies re-verified. Any errors found will be corrected and recorded. Any errors discovered will be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

QA/QC for data entry to produce reliable carbon estimates the proper entry of data into the data analyses spreadsheets is required. Steps will be taken to ensure that errors are minimized. Results will be reviewed and double-checked for typing errors. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

QA/QC for data archiving Due to the long-term length of the project activities, data storage and maintenance is very important. All electronic data and reports will be copied on durable media such as compact discs (CDs) and copies of the CDs will be stored in multiple locations. The archives include i) Copies of all original field measurement data, laboratory data, data analysis spreadsheets; ii) Estimates of the carbon stock changes in all chosen pools and non-CO2 GHG and corresponding calculation spreadsheets; iii) GIS products; iv) Copies of the measuring and monitoring reports.

# APPENDIX I: AFOLU NON-PERMANENCE RISK ASSESSMENT (AFOLU NON-PERMANENCE RISK TOOL VERSION 4.0)

## CONTENTS

# 1 INTERNAL RISK

## 1.1 Project Management

**a) Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located.**

The species planted in the project activity is *Eucalyptus tereticornis*. It is a native of Australia and very well-adapted to the Indian edapho-climatic conditions. It is also the most widely planted species of Eucalyptus species in India. The *Eucalyptus* species was introduced in 1790 near Nandi Hills of Bengaluru, South India. It is well-adapted to the dry, stressed climatic conditions of India and can also thrive in saline soils. It is also resistant to termites and pests attack. Some other features which makes *E. tereticornis* a successfully adapted to the Indian climate are: (a) it is a fast growing species (b) resistant to fire and grazing, and (c) can compete with the weeds for soil nutrients.

Eucalyptus makes only use of sub-soil moisture leaving top soil moisture untouched and intact that can be used by undergrowth and agricultural crops. Moreover, even though eucalyptus utilizes sub-surface water, it does not deplete it[23]. The taproot of *Eucalyptus tereticornis* grows upto 3 m while lateral root spread upto 3.5 m. while depth of water table is often as much as 10 m. Therefore, it only consumes sub-soil moisture around and upto 3m depth and hence does not affect the water table. Generally the water table is situated very deep in ground, between 10 m to 30 m whereas the taproot of Eucalyptus goes down to 3 to 4 m. Therefore, there is little possibility that it can reach the water table and lower its level. The utilization of soil moisture by Eucalyptus depends on the stand density, soil and environmental conditions. The transpiration in Eucalyptus is dependent on soil moisture availability and it is high only when there is adequate amount of soil moisture[24]. This species is very efficient in water consumption and therefore changes its water consumption according to the soil moisture availability[25]. The water budget of Eucalyptus however is efficient compared to other trees as per unit of wood production the water consumption is low (Rajan, 1987). The water use of Eucalyptus is found to be 785 litres/kg of total biomass, which is much lower when compared with some Indian tree species like Acacia (1323 litres/kg), Dalbergia sissoo (1484 litres/kg) and agricultural crops like paddy rice (2000 litres/kg) and cotton (3200 litres/kg)[26]. Therefore, Eucalyptus appears to use less water per unit weight of biomass produced than other kinds of trees and many agricultural crops (Davidson, 1985 & 1998). Eucalyptus is being widely grown in North Indian states like Punjab and Haryana as a raw material for paper and pulp industry. In those states it is mainly grown in agroforestry model along with crops like wheat, mustard, fodder crops and potato without negatively affecting the production of these crops[27]. Prior to the project, the lands in the project area were degraded and degrading with sparse vegetation. Eucalyptus being a water efficient

[23] http://www.fao.org/3/XII/0500-B2.htm#P28_106
[24] Poore, M.E.D. and Fries, C. 1987. The Ecological Effects of Eucalyptus. Natraj Publishers, Dehradun, pp. 98.
[25] https://www.downtoearth.org.in/blog/water/why-eucalyptus--60275#:~:text=However%2C%20there%20are%20no%20concrete,impact%20on%20the%20water%20table.
[26] https://www.downtoearth.org.in/blog/water/why-eucalyptus--60275#:~:text=However%2C%20there%20are%20no%20concrete,impact%20on%20the%20water%20table.
[27]https://pbforests.gov.in/Pdfs/forest%20literature/BOOKLETS%20AND%20LEAFLETS/Booklets/AGROFORESTRY%20-%20A%20VIABLE%20OPTION%20FOR%20CROP%20DIVERSIFICATION%0IN%20PUNJAB%20IN%20ENGLISH.pdf 2

species can survive in this nutrient and water deficient soils. Only degraded unused lands were selected for the project and no cultivable lands were selected.

**References:**

Palanna RM, 1996. 'Eucalyptus in India'. In: FAO. Reports submitted to the regional expert consultation on eucalyptus (Volume II). RAP, Bangladesh. (http://www.fao.org/3/AC772E/ac772e06.htm)

Kumar PA, Mishra AK, Kumar M, Chaudhari SK, Singh RA, Singh K, Rai PO, Sharma DK. Biomass production and carbon sequestration of Eucalyptus tereticornis plantation in reclaimed sodic soils of north-west India. Indian Journal of Agricultural Sciences. 2019 Jul 1; 89 (7):1091-5.

Rajan, B.K.C. (1987). Versatile Eucalyptus. Diana Pub., Bangalore. pp: 41-201.

Davidson.J. (1985), Setting aside the idea that Eucalyptus are always bad. FAO pub, Rome

**b) Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued.**

The ongoing enforcement to prevent encroachment by outside actors is not required to protect stocks. The lands in the project areas are owned by the farmers and tribal people. The farmers own the legal title of their lands. Each participating farmer is bound to manage and protect the tree plantations from illegal felling. They also agree to deposit the title deed of the land with bank as security till the entire loan with accrued interest is paid back. For transparency, the loan is disbursed to the farmers through Saving Bank account opened in their name at respective branch of financing banks.

**c) Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (i.e., any area of required experience is not covered by at least one individual with at least 5 years' experience in the area).**

The management team of Mangalam Timber Private Limited (MTPL) has extensive experience in this field much more than 5 years. Mangalam Timber Products Limited is a part of B K Birla Group, a premier business conglomerate of India, was established on 27th August, 1982. MTPL is one of the leading wood processing companies of India with head office located in Kolkata, Eastern India with wide-extensive networks in 20 cities of India. The company's management systems are certified to international standards, ISO 9001:2008 for quality, ISO 14001:2004 for environment and OHSAS 18001:2007 for occupational health & safety. MTPL has established "Quality Management System in Plantation & Forestry", wherein a set of procedures has been laid down to implement and monitor the project activity. These procedures to manage the project include:

a) Staff training
b) Data and record keeping arrangements
c) Data collection
d) Data entry and archiving
e) Data quality control and quality assurance

Because of extensive experience of the company, there is no lack of management and skills and therefore there is no risk associated to the project in this regard.

**d) Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area.**

The project activity is spread across seven districts namely Nabarangpur, Koraput & Malkangiri in Odisha, Vishakhapatnam, Vizianagaram & Srikakulm in Andhra Pradesh and Bastar in Chhattisgarh. The management team of the company is based in India headquartered in Kolkata with offices located in around 20 cities of India. The travel to the project sites from office locations to the project activity sites takes less than a day.

**Table 1:** Time taken to reach the project area from the nearest office location

| Project site | Nearest office location | Distance (Km) | Approximate time required to reach project site from office location by road (on normal traffic) |
|---|---|---|---|
| Nabarangpur, Odisha | Nabarangpur, Odisha | 0 | 0 hr |
| Koraput, Odisha | Nabarangpur, Odisha | 58.9 | 1 hr 13 min |
| Malkangiri, Odisha | Nabarangpur, Odisha | 153 | 3 hr 28 min |
| Vishakhapatnam, Andhra Pradesh | Vishakhapatnam, Andhra Pradesh | 0 | 0 hr |
| Vizianagaram, Andhra Pradesh | Vishakhapatnam, Andhra Pradesh | 65.9 | 1 hr 41 min |
| Srikakulm, Andhra Pradesh | Vishakhapatnam, Andhra Pradesh | 114.2 | 2 hr 35 min |
| Bastar, Chhattisgarh | Nabarangpur, Odisha | 100 | 2 hr |

**e) Mitigation: Management team includes individuals with significant experience Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (eg, individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs.**

The management team includes experts with significant experience in AFOLU project design and implementation carbon accounting and reporting under the VCS Program and other approved GHG programs, that is, UNFCCC Clean Development Mechanism (CDM). The project has already been registered under UNFCCC CDM Standard and has gone through validation and verification with participation from the CDM management team of MTPL.

**f) Mitigation: Adaptive management plan in place**

**Table 2:** Addressing of the identified risks associated with the project

| Risk identified | Risk management plan |
|---|---|
| Commercial risks involved in reforestation on degraded land. Because of degraded nature of land yield fluctuation and poor productivity adversely affect the Return of Investment (ROI) of the project. | As per the tripartite agreement entered between the company, bank and the farmers, the company provides buy back guarantee for timber proceeds at market price prevailing at the time of harvest.<br><br>The company creates awareness and encourages farmers for reforestation, provides technical assistance, nursery facility, arrange finance from bank, monitors.<br><br>Survival checking: |

| | |
|---|---|
| | 1) The initial survival rate of planted trees shall be counted three months after the planting, and re-planting shall be conducted if the survival rate is lower than 90 percent of the final planting density.<br>2) Final checking three years after the planting;<br><br>3) The checking of the survival rate may be conducted using permanent sample plots. |
| The reforestation sites are mostly in remote areas where road connectivity is poor, roads are undeveloped putting major barrier in transportation of harvested crop. | During the project development the size and the location of the project area were negotiated with the villages and the figures on size were subject to the contractual arrangements. The reforestation sites are mostly accessible to the nearest company branch locations. |

**Table 3:** Project management risk assessment

| Project Management | | | |
|---|---|---|---|
| a) | Species planted (where applicable) associated with more than 25% of the stocks on which GHG credits have previously been issued are not native or proven to be adapted to the same or similar agro-ecological zone(s) in which the project is located. | | 0 |
| b) | Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued. | | 0 |
| c) | Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years' experience in the area). | | 0 |
| d) | Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area. | | 0 |
| e) | **Mitigation:** Management team includes individuals with significant experience Management team includes individuals with significant experience in AFOLU project design and implementation, carbon accounting and reporting (eg, individuals who have successfully managed projects through validation, verification and issuance of GHG credits) under the VCS Program or other approved GHG programs. | | 0 |
| f) | **Mitigation:** Adaptive management plan in place | | 0 |
| **Total Project Management [a + b + c + d + e + f]** | | | 0 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | | |

## 1.2 Financial Viability

**Q. How many years does it take for the cumulative cashflow to break even?**

It was expected to bring benefits to farmers of this project from the first harvesting year, that is from 2005 onwards to 2011 depending on the different locations. Therefore, cumulative cashflow to break even may not be applicable as it varies from farmer to farmer. Also farmers took loan to cover the basic cost of plantation.

**Q. What percentage of funding is needed to cover the total cash out before the project breaks even has been secured?**

The lands on which the project activity is implemented are owned by the individual farmers who mainly small landholders. The farmers were mobilized to plant eucalyptus species on their lands which would have been left barren otherwise. Under the Farm Forestry Scheme of NABARD, farmers received small loans from the nodal banks to incur the costs of seedlings, fertilizers, and maintenance of plantation. It covered their basic costs.

**a) Project cash flow breakeven point is greater than 10 years from the current risk assessment**

Not applicable. The project cashflow for the farmers who were selling the harvested eucalyptus from 2005 onwards to 2011 varies locations. The land which would have been otherwise left barren with no use were planted with eucalyptus, whose timber has demand and market value.

**b) Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment**

No, the project cash flow breakeven point is not between 7 and up to 10 years from the current risk assessment. It should be from 2001 (project start year) to 2005-2011 depending on the project sites.

**c) Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment**

No, the project cash flow breakeven point is not between 4 and up to less than 7 years from the current risk assessment. The land which would have been otherwise left barren with no use were planted with eucalyptus, whose timber has demand and market value.

**d) Project cash flow breakeven point is less than 4 years from the current risk assessment**

No, the project cash flow breakeven point is not less than 4 years from the current risk assessment. The land which would have been otherwise left barren with no use were planted with eucalyptus, whose timber has demand and market value.

**e) Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven**

Not applicable. Farmers had applied for loans for covering the minimal cost of plantation and management. It varies from farmer to farmer. The mobilization and technical training cost was incurred by MTPL. The land which would have been otherwise left barren with no use were planted with eucalyptus, whose timber has demand and market value.

**f) Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven**

Not applicable. Farmers had applied for loans for covering the minimal cost of plantation and management. It varies from farmer to farmer. The mobilization and technical training cost was incurred by MTPL.

**g) Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven**

Not applicable. Farmers had applied for loans for covering the minimal cost of plantation and management. It varies from farmer to farmer. The mobilization and technical training cost was incurred by MTPL.

**h) Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven**

Not applicable. Farmers had applied for loans for covering the minimal cost of plantation and management. It varies from farmer to farmer. The mobilization and technical training cost was incurred by MTPL.

i) **Mitigation: Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven**

Farm Forestry Scheme approved by NABARD for Eucalyptus plantation on degraded land with bank finance was prepared and company's field officers approached the farmers and tribal of nearby villages with the scheme. The company incurred direct expenses of more than Rs. 10, 00, 00 in the very first year of plantation.

**Table 4:** Expenses incurred in the first year of plantation

| Sl. No. | Expense account head | Total cost in 2001-02 (Rs) |
|---|---|---|
| 1 | Salary & wages | 7,69,212 |
| 2 | Two wheeler expenses | 21,040 |
| 3 | Staff conveyance | 62,484 |
| 4 | Vehicle hiring expense | 1,90,682 |
| | **Total:** | **10,43,418.4** |

The above expenses are direct expenses computed conservatively for plantation activity based on company's book of accounts of 2001-02 which are likely to increase every year due to inflation as well as increase in planted area. The company provides the above services free of charge as stipulated in Article 1.3 of the tripartite agreement without which the project would have not happened.

**Table 5:** Financial viability risk assessment

| Financial Viability | | | |
|---|---|---|---|
| Q | How many years does it take for the cumulative cashflow to break even? | | d) |
| Q | What percentage of funding is needed to cover the total cash out before the project breaks even has been secured? | | h) |

| | | |
|---|---|---|
| a) | Project cash flow breakeven point is greater than 10 years from the current risk assessment | 0 |
| b) | Project cash flow breakeven point is between 7 and up to less than 10 years from the current risk assessment | 0 |
| c) | Project cash flow breakeven point between 4 and up to less than 7 years from the current risk assessment | 0 |
| d) | Project cash flow breakeven point is less than 4 years from the current risk assessment | 0 |
| e) | Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven | 0 |
| f) | Project has secured 15% to less than 40% of funding needed to cover the total cash out required before the project reaches breakeven | 0 |
| g) | Project has secured 40% to less than 80% of funding needed to cover the total cash out required before the project reaches breakeven | 0 |
| h) | Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven | 0 |
| i) | **Mitigation:** Project has available as callable financial resources at least 50% of total cash out before project reaches breakeven | -2 |
| **Total Financial Viability [(a, b, c or d) + (e, f, g or h) + i]** | | 0 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | |

## 1.3 Opportunity Cost

**Q. What is the NPV from the most profitable alternative land use activity compared to NPV of project activity?**

Not applicable

**a) NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated**

Not applicable

**b) NPV from the most profitable alternative land use activity is expected to be between 50% and up to100% more than from project activities**

Not applicable

**c) NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities**

Not applicable

**d) NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated**

According to Section 2.2.3.2 AFOLU Non-Permanence Risk Tool, "Where the majority of baseline activities over the length of the project crediting period are subsistence-driven, an NPV analysis is not required, but an assessment of the net impacts of the project on the social and economic well-being of the communities who derive livelihoods from the project area (see Section 0) shall be undertaken. Based on this assessment, the project shall be assigned an opportunity cost score as set out in Table." The majority of the baseline activity in the project areas in subsistence based. The land prior to the plantation activity was degraded and left mostly barren with little farming activities. The sustainable development aspects and positive impact to the community has been described in the CDM PDD (https://cdm.unfccc.int/filestorage/2/M/E/2ME6KY1OR9LTX8NVPJ34IA70CG5SFZ/PDD.pdf?t=ZmV8cXE1bWxpfDDiv6OQ8pq6AFExFECOevg-).

**e) NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity**

Not applicable

f) NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity

Not applicable

g) **Mitigation:** Project proponent is a non-profit organization

Not applicable

h) **Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period (see project longevity)

A tripartite agreement is entered into between the farmer, bank and the company on mutually agreed terms wherein the obligations of all the three parties are clearly stated. MTPL agrees to supply good quality of seedlings and fertilizers on competitive price to farmers. The company ensures free replacement of moratorium. The company agrees to provide technical, assistance and services relating to planting and maintenance of such plantation till they are harvested. The company also assists farmers to obtain no objection certificate for plantation, felling, cutting and billeting of trees and transportation of timber from farmers site to the factory of the company from competent authority of the forest department as and when required. The company agrees to buy back the harvested timber at prevailing market price or minimum rate mentioned in the agreement or at the rate fixed by Odisha Forest Development Corporation whichever is higher at the time of harvest.

**i) Mitigation: Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity)**

Not applicable.

**Table 6:** Opportunity cost risk assessment

| Opportunity Cost | | |
|---|---|---|
| Q | What is the NPV from the most profitable alternative land use activity compared to NPV of project activity? | d) |
| a) | NPV from the most profitable alternative land use activity is expected to be at least 100% more than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated | 0 |
| b) | NPV from the most profitable alternative land use activity is expected to be between 50% and up to100% more than from project activities | 0 |

| | | |
|---|---|---|
| c) | NPV from the most profitable alternative land use activity is expected to be between 20% and up to 50% more than from project activities | 0 |
| d) | NPV from the most profitable alternative land use activity is expected to be between 20% more than and up to 20% less than from project activities; or where baseline activities are subsistence-driven, net positive community impacts are demonstrated | 0 |
| e) | NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity | 0 |
| f) | NPV from project activities is expected to be at least 50% more profitable than the most profitable alternative land use activity | 0 |
| g) | **Mitigation:** Project proponent is a non-profit organization | 0 |
| h) | **Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over the length of the project crediting period (see project longevity) | 0 |
| i) | **Mitigation:** Project is protected by legally binding commitment to continue management practices that protect the credited carbon stocks over at least 100 years (see project longevity) | 0 |
| **Total Opportunity Cost [(a, b, c, d, e or f) + (g + h or i)]** | | 0 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | |
| Total may be less than zero | | |

## 1.4 Project Longevity

**Q. Does the project have a legally binding agreement that covers at least a 100 year period from the project start date?**

Not applicable

**Q. What is the project Longevity in years?**

The expected operational lifetime of the project activity is 50 years 0 months.

**Q. Legal Agreement or requirement to continue management practice?**

A tripartite agreement is entered into between the farmer, bank and the company on mutually agreed terms wherein the obligations of all the three parties are clearly stated.

a) Without legal agreement or requirement to continue the management practice

The project is occurring because of the legal agreement.

**b) With legal agreement or requirement to continue the management practice**

With legal agreement the project will operate for 50 years.

**Table 7:** Project longevity risk assessment

| Project Longevity | | | |
|---|---|---|---|
| Q | Does the project have a legally binding agreement that covers at least a 100 year period from the project start date? | | No |
| Q | What is the project Longevity in years? | | 50 |
| Q | Legal Agreement or requirement to continue management practice? | | Yes |
| a) | Without legal agreement or requirement to continue the management practice | | 0 |
| b) | With legal agreement or requirement to continue the management practice | | 5 |
| **Total Project Longevity** | | | 5 |
| Note: Total may not be less than zero.<br>Any project with a legally binding agreement that covers at least a 100 year period from the project start date will be assigned a score of zero.<br>Any project with a project longevity of less than 30 years fails the risk assessment | | | |

**Table 8:** Total inernal risk assessment

| | |
|---|---|
| **Total Internal Risk (PM + FV + OC + PL)** | 5 |
| Note: Total may not be less than zero | |

# 2 EXTERNAL RISK

## 2.1 Land Tenure and Resource Access Impacts

Q. Are the ownership and resource access/use rights held by the same of different entities?

The reforestation under the project activity is on many small parcels of land owned by respective farmers & tribal persons.

**a) Ownership and resource access/use rights are held by same entity(s)**

The reforestation under the project activity is on many small parcels of land owned by respective farmers & tribal persons.

**b) The reforestation under the project activity is on many small parcels of land owned by respective farmers & tribal persons.**

The reforestation under the project activity is on many small parcels of land owned by respective farmers & tribal persons.

**c) In more than 5% of the project area, there exist disputes over land tenure or ownership**

Clear title is ensured through land title document issued by land revenue authorities of respective state government, locally known as "Land Patta" in Odisha & Chhatishgrh and "Land Passbook" in Andhra Pradesh. Nilencumbrance certificate (NEC) and No-dues certificate (NDC) is also obtained from land revenue officials in respect of each land parcel to ensure that the land is free from any burden and that the title is clear.

**d) There exist disputes over access/use rights (or overlapping rights)**

Not applicable.

**e) WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts**

Not applicable.

**f) Mitigation: Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period**

The reforestation under the project activity is on many small parcels of land owned by respective farmers & tribal persons.

**g) Mitigation: Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims**

Not applicable

**Table 9:** Land tenure and resource access impacts risk assessment

| Land Tenure and Resource Access Impacts | | | |
|---|---|---|---|
| Q | Are the ownership and resource access/use rights held by the same of different entities? | | Different |
| a) | Ownership and resource access/use rights are held by same entity(s) | | 0 |
| b) | Ownership and resource access/use rights are held by different entity(s) (eg, land is government owned and the project proponent holds a lease or concession) | | 2 |
| c) | In more than 5% of the project area, there exist disputes over land tenure or ownership | | 0 |
| d) | There exist disputes over access/use rights (or overlapping rights) | | 0 |
| e) | WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts | | 0 |
| f) | **Mitigation:** Project area is protected by legally binding commitment (eg, a conservation easement or protected area) to continue management practices that protect carbon stocks over the length of the project crediting period | | -2 |

| | | | |
|---|---|---|---|
| g) | **Mitigation:** Where disputes over land tenure, ownership or access/use rights exist, documented evidence is provided that projects have implemented activities to resolve the disputes or clarify overlapping claims | | 0 |
| Total Land Tenure [(a or b) + c + d + e + f +g)] | | | 0 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | | |
| Total may not be less than zero | | | |

## 2.2 Community Engagement

**a) Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted**

The company started plantation activity in 2001-02 and engaged 14 dedicated personnel for giving technical demonstration & consultation, visiting farmers, organizing meetings with them to propel FFS and motivate their participation, organizing training for them and monitoring the plantation activity in the degraded land.

**b) Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted**

The stakeholders identified are mainly the farmers who are participating in the project activity apart from nearby villagers, local panchayet, forest officials and the employees of the company. The views and comments of the stakeholders were collected by way of conducting a series of stakeholders' consultation meetings as well as through PRA exercise.

**c) Mitigation: The project generates net positive impacts on the social and economic well- being of the local communities who derive livelihoods from the project area**

- The reforestation project is a human induced reforestation on degraded lands and erosion prone areas to improve soil stabilization and soil fertility. Soil organic matter will increase as result of increase of net primary productivity and degraded soil will be improved.
- The reforestation under the project activity is on degraded land which was lying barren since decades. The farmers who own the land are mainly poor farmers/tribal communities who do not have the capability of growing plantation of their own without any external financial support and technical guidance. They do not have capital to invest for plantation without any return for five years. In absence of the project activity the land would have continued as degraded land or degrading would continue further.
- *Eucalyptus* being fast growing species, the project activity could generate more income opportunities for the farmers in the long term.
- Silviculture activities like raising nursery, site preparation, seedling transportation, planting, fencing and maintenance of plantation will generate employment opportunity for the local community.
- The carbon revenues generated from the project activity will be shared with the participating farmers through a carbon contract entered between MTPL, the project implementing agency and the participating farmers individually, thus resulting into additional financial support to them.

**Table 10:** Community engagement risk assessment

| Community Engagement |
|---|

| | | | |
|---|---|---|---|
| a) | Less than 50 percent of households living within the project area who are reliant on the project area, have been consulted | | 0 |
| b) | Less than 20 percent of households living within 20 km of the project boundary outside the project area, and who are reliant on the project area, have been consulted | | 0 |
| c) | **Mitigation:** The project generates net positive impacts on the social and economic well-being of the local communities who derive livelihoods from the project area | | -5 |
| **Total Community Engagement [a + b + c]** | | | **-5** |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | | |
| Total may be less than zero | | | |

## 2.3 Political Risk

Q. What is the country's calculated Governance score?
India's average Governance score from 2015 to 2019 is -0.147

a) Governance score of less than -0.79
Not applicable.

b) Governance score of -0.79 to less than -0.32
Not applicable

c) Governance score of -0.32 to less than 0.19

India's average Governance score from 2015 to 2019 is -0.147

**Table 11:** The year wise and indicator wise political risk score from 2015 to 2019

| Indicators | 2015 | 2016 | 2017 | 2018 | 2019 | Average of 5 years data for each indicator |
|---|---|---|---|---|---|---|
| Voice and Accountability | 0.43 | 0.44 | 0.39 | 0.38 | 0.29 | 0.386 |
| Political Stability and Absence of Violence | -0.95 | -0.95 | -0.76 | -0.98 | -0.7 | -0.868 |
| Government Effectiveness | 0.09 | 0.08 | 0.09 | 0.28 | 0.17 | 0.142 |
| Regulatory Quality | -0.39 | -0.31 | -0.25 | -0.23 | -0.16 | -0.268 |
| Rule of law | -0.05 | -0.03 | 0 | 0.03 | -0.03 | -0.016 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Control of Corruption | **-0.35** | -0.28 | -0.24 | -0.19 | -0.23 | -0.258 |
| The mean of Governance Scores across the six indicators of the World Bank Institute's Worldwide Governance Indicators (WGI) | | | | | | **-0.147** |

d) Governance score of 0.19 to less than 0.82

Not applicable

e) Governance score of 0.82 or higher

Not applicable

f) **Mitigation:** Country implementing REDD+ Readiness or other activities such as:

a) The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors
b) The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative
c) The jurisdiction in which the project is located is participating in the Governors' Climate and Forest Taskforce
d) The country has an established national FSC or PEFC standards body
e) The country has an established DNA under the CDM and has at least one registered CDM A/R project

India has developed ambitious National Redd-plus strategy[28] and shared the same with UNFCCC. Under this strategy, following objectives will be covered:

a) Reducing degradation of forest ecosystems
b) Reducing deforestation
c) Conservation of existing carbon stocks
d) Sustainable forest management
e) Enhancement of forest carbon stocks

In addition, India has set a clear cut implementation frame work and financing mechanisms. Moreover, Redd-plus strategy will be converged with other major environmental programs of India such as Namami Gange Programme for the rejuvenation of River Ganga.

**Table 12:** Political risk assessment

| Political Risk | | |
|---|---|---|
| Q | What is the country's calculated Governance score? | -0.147 |
| a) | Governance score of less than -0.79 | |

[28] https://redd.unfccc.int/files/india_national_redd__strategy.pdf

| | | |
|---|---|---|
| | | 0 |
| b) | Governance score of -0.79 to less than -0.32 | 0 |
| c) | Governance score of -0.32 to less than 0.19 | 2 |
| d) | Governance score of 0.19 to less than 0.82 | 0 |
| e) | Governance score of 0.82 or higher | 0 |
| f) | **Mitigation:** Country implementing REDD+ Readiness or other activities such as:<br>a) The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors<br>b) The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative<br>c) The jurisdiction in which the project is located is participating in the Governors' Climate and Forest Taskforce<br>d) The country has an established national FSC or PEFC standards body<br>e) The country has an established DNA under the CDM and has at least one registered CDM A/R project | -2 |
| **Total Political [(a, b, c, d or e) + f)]** | | 0 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | | |
| Total may not be less than zero | | |

# 3 NATURAL RISK

## Natural Risk: Fire

## 3.1 Significance

The project is spread over three different states of India – Odisha, Andhra Pradesh and Chhattisgarh. The parcels in the project areas are scattered which reduced the risk of travel of fire from one parcel to another. There were no loss due to fire hazard and significance is zero.

## 3.2 Likelihood

The likelihood of fire is minimal. The project parcels are dispersed and scattered all over the project site which reduces the chance of travel of fires from one parcel to another in case of any fire event. The species selected for the project is *Eucalyptus*. It is very fire resistant species. In fact, it can actually fight fires by acting as a windbreak and can block flying embers[29].

## 3.3 Score (LS)

0

### Mitigation

[29] Eucalyptus Myths | Save Mount Sutro Forest

### 3.3.1

The risk of fire is mitigated by the project design:

- There are many discrete, small and scattered land parcels in the project areas.
- Eucalyptus is a very fire resistant species.
- The farmers agree to plantation on their degraded land, their upkeep for proper growth and protection form illegal felling and other forest related hazards, such as fires.

# Natural Risk: Pest and Disease Outbreaks (PD)

## 3.4 Significance

Pest attack or disease outbreaks can reduce the capacity of trees to capture and sequester carbon. Pest infestation can severely affect the vital physiological functions of the forests.

## 3.5 Likelihood

The species selected for the project is Eucalyptus, which is in fact it is resistant to many insects and beetles. Essential oil produced from the Eucalyptus has anti-bacterial and natural insecticidal properties. There have been no losses due to pest and disease outbreaks during this period and significance is zero.

## 3.6 Score (LS)

0

### Mitigation

The risk of future pest and disease outbreaks is greatly mitigated by the project design:

- There are many discrete parcels in the project areas which are scattered all over.
- Farmers and tribal are protecting the trees and can alarm the developers in case of pest attack for earlier and quicker actions.

### 3.6.1

- Eucalyptus is resistant to many pests and insects.

### Natural Risk: Extreme Weather

## 3.7 Significance

Coastal Odisha (earlier Odisha) is prone to cyclones arising from Bay of Bengal. Coastal Odisha was severely affected during 1999 super-cyclone[30]. More recently (in May 2020), Coastal Odisha was slightly affected by Cyclone Amphan[31]. Nabarangpur district, which is one of the districts of Odisha where project

[30] www.rsmcnewdelhi.imd.gov.in/images/pdf/archive/rsmc/1999.pdf

[31] Cyclone 'Amphan' updates: Cyclone moves closer to Odisha coast, mass evacuation in Bengal (livemint.com)

activity is located, is a drought prone area. During the month of May, Odisha reports occurrence of heat waves with human casualties. The temperature is the summers can go upto 45$^{0}$C.

Coastal Andhra Pradesh, which includes the project districts - Vizianagaram, Srikakulam and Vishakhapatnam is prone to cyclones arising from Bay of Bengal. Cyclone Fani in 1999 affected both Odisha and Andhra Pradesh. Although the effect of cyclone Fani was much lesser in Andhra Pradesh where no human casualty was reported[32] but Coastal Odisha (mainly Puri and Khorda districts) was severely affected with human casualty around 72 lives[33].

## 3.8 Likelihood

The project locations in Odisha is located in the interior part of Odisha and therefore protected from the cyclones arising from Bay of Bengal. Crop loss and human casualty due to cyclones have reported only in the Coastal parts of Odisha. Nabarangpur, Malkangiri and Koraput are located away from the coastal part of Odisha. Droughts are common natural hazards in Nabarangpur and Bastar. However, species planted in the project area, which in *Eucalyptus tereticornis* is a drought resistant species due to its deep root networks which extract moisture from soil during dry months.

## 3.9 Score (LS)

0

### Mitigation

The risk of extreme weather is minimized during the project design itself. Some of the natural extreme weather risk aversion measures are listed below:

- The location of the project sites in Odisha (Nabrangpur, Koraput and Malkangiri) and Chhattisgarh (Bastar) are located far from the coastal Odisha and therefore protected from any future cyclone events.

3.9.1

- The location of project sites in Andhra Pradesh, that are Vizianagram, Vishakhapatnam and Srikakulam, is on coastal part of the state. However, the impacts of cyclones arising from Bay of Bengal have mostly be on Odisha. Coastal Andhra Pradesh has often reported comparatively lesser loss from cyclone in comparison to Odisha.
- The Government of India created National Disaster Management Authority (NDMA) in 2005 to prepare the states from upcoming any natural disasters as well as to reduce the unavoidable impacts of extreme weather situations. NDMA trains and equips the government officials and general public with preparation for natural disasters. NDMA has laid down many specialized mitigation measures depending on the nature of extreme weather.

[32] Andhra Pradesh pegs loss due to Cyclone Fani at ₹58.62 crore - The Hindu

[33] India: Death toll from cyclone Fani climbs to 64 (aa.com.tr)

- Cyclone prone states like Odisha[34] and Coastal Andhra Pradesh[35] have developed robust and one of a kind early warning systems to prepare the communities and local governments well in advance for any approaching cyclones. The urgent information and preparation requirements are disseminated through conventional channels like radio, mobile phone messages, televisions, etc. It helps the communities and the governments to prepare accordingly and therefore minimizing property loss and loss of human lives.

## Natural Risk: Geological risk

### 3.10 Significance

National Institute of Disaster Management Institute, Government of India has divided India into four seismic zones depending on the vulnerability to earthquakes – Zone II, III, IV and V, with zone V having highest risk and zone I in the lowest risk category. Earthquake events may cause property damages and loss of lives depending on the severity and vulnerability of the locations. Around 59% of India's landmass is prone to the earthquake.

### 3.11 Likelihood

The project locations in Odisha, Andhra Pradesh and Chhattisgarh are located in the Zone II of the earthquake zone map. Zone II is a low risk zone (see figure below; the area marked with red square contains the project area) and therefore free from any catastrophic types of earthquake events.

[34] Odisha launches disaster alert system for its coast - The Hindu

[35] AP 2nd state in country to set up cyclone warning system | Vijayawada News - Times of India (indiatimes.com)

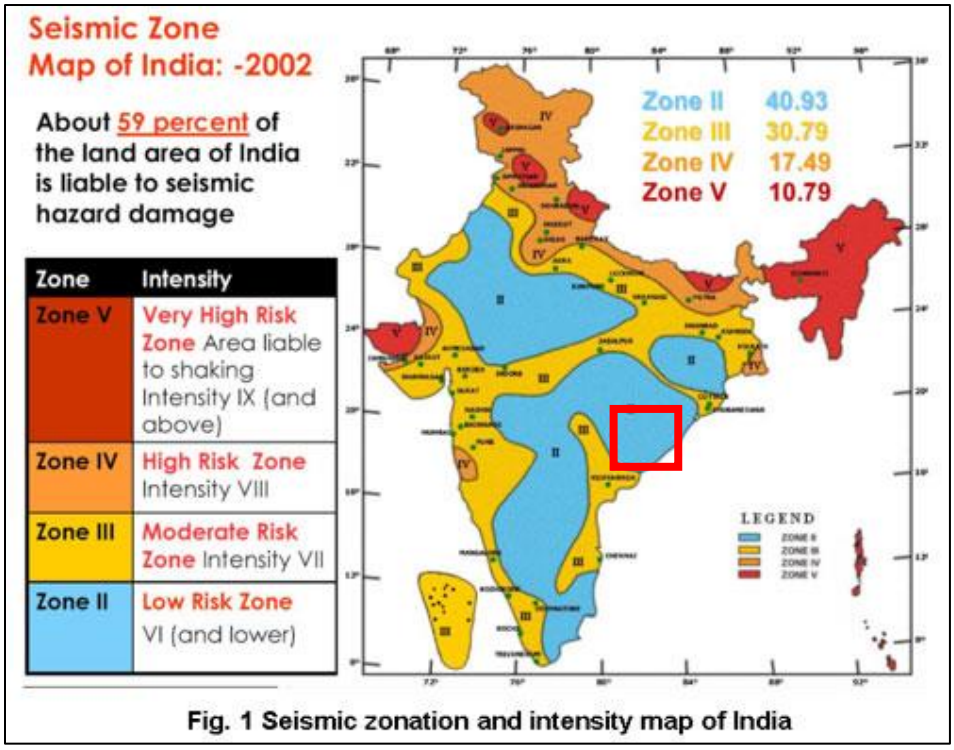


Fig. 1 Seismic zonation and intensity map of India

## 3.12 Score (LS)

0

### Mitigation

The fact that the project areas are located in the Zone II of the seismic zone map of India makes the project areas safe from any earthquake events.

Table 13: Natural risk assessment

| Risk Category Factors | Natural Risk | LS | M | Risk Rating |
|---|---|---|---|---|
| a) | Fire (F) | 0 | 0.50 | 0.00 |
| b) | Pest and Disease Outbreaks (PD) | 0 | 0.25 | 0.00 |
| c) | Extreme Weather (W) | 0 | 0.50 | 0.00 |
| d) | Geological Risk (G) | 0 | 0.25 | 0.00 |
| e) | Other natural risk (ON1) | 0 | 0.25 | 0.00 |
| f) | Other natural risk (ON2) | 0 | 0.25 | 0.00 |
| g) | Other natural risk (ON3) | 0 | 0.25 | 0.00 |

| | |
|---|---|
| **Total Natural Risk [F + PD + W + G + ON]** | 0.00 |
| Note: When a risk factor does not apply to the project, the score shall be zero for such factor | |
| Risk rating is determined by [LS x M] | |

# 4.1. OVERALL NON-PERMANENCE RISK - RATING AND BUFFER DETERMINATION

4.2. Overall risk rating:

Table 14: Overall risk rating

| Risk Category | | Rating |
|---|---|---|
| a) | Internal risk | 5.00 |
| b) | External risk | 0.00 |
| c) | Natural Risk | 0.00 |
| **Overall risk rating (a + b + c)** | | 10 |

Note: The minimum risk rating shall be 10, regardless of the risk rating calculated.