FUTURE GREEN CARBON PROJECT

Eldorado Brasil Celulose S/A with the support of Plantar Carbon

Project Title	Future Green Carbon Project
Version	1
Date of Issue	18/10/2022
Prepared By	Eldorado Brasil Celulose S/A with the support of Plantar Carbon
Contact	Av. Marginal Direita do Tietê, 500 - São Paulo, SP – Brasil - CEP 05118-100 Phone: +55 (67)99634-3800 Mr. Fabio José de Paula E-mail: fabio.paula@eldoradobrasil.com.br

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

"Future Green Carbon Project" is an AFOLU initiative to be implemented in the Central-West region of Brazil, specifically in the state of Mato Grosso do Sul (MS). It is a voluntary action of Eldorado Brasil Celulose S/A, hereinafter Eldorado, aiming at the reforestation of more than 100,000 hectares with new and additional eucalyptus plantations, established exclusively on non-forested and anthropized areas. In addition to the creation of carbon stocks through reforestation activities for production purposes, the project will also enable the recovery and conservation of carbon stocks based on native species for conservation purposes. Even though the restoration of such areas will be enabled by the project, resulting in direct climate benefits, VCUs will not be claimed for such activities.

The project activity falls into the ARR category and proposes the reforestation of non-forested lands which are often poorly managed and/or degraded and were dedicated to traditional uses that prevail in the project region (MS), such as pasturelands for cattle and agriculture. The State of Mato Grosso do Sul is widely known as part of the growing agriculture frontier in Brazil (pastureland and agriculture), covering approximately 84% of its total area (see Figure 7). Hence, the proposed activity will generate carbon stocks and GHG removals by sinks additional to those that would occur in its absence, promoting a meaningful change in land use, upgrading the status and productivity of lands. The measures adopted by the grouped project are reforestation activities, with a view to production of wood through *Eucalyptus.spp* genus relying on the most advanced silvicultural techniques, on an integrated basis with the recovery and conservation of native vegetation.

In the absence of the proposed project, the project areas would remain as pasture, or agriculture, especially soybeans. Under this land use scenario, the benefits proposed by the project, for example, the restoration of native vegetation, protection, and regularization of the conservation areas of the properties, as well as other social and environmental activities, including new measures under FSC or CERFLOR certifications (see below), would not happen. Thus, in the absence of the proposed grouped project, the pre-project land use scenario would maintain its status, including degradation and risks to the local biome, the Cerrado[1] (Brazilian savannah), which has suffered great anthropogenic pressure in recent decades with its native vegetation replaced by pastures and agricultural areas[2]. The biome appears in second place in the 2022 deforestation ranking with 659,670 hectares deforested. The total deforested area represents almost one third of the natural vegetation suppressed in the country (32.1%).

---

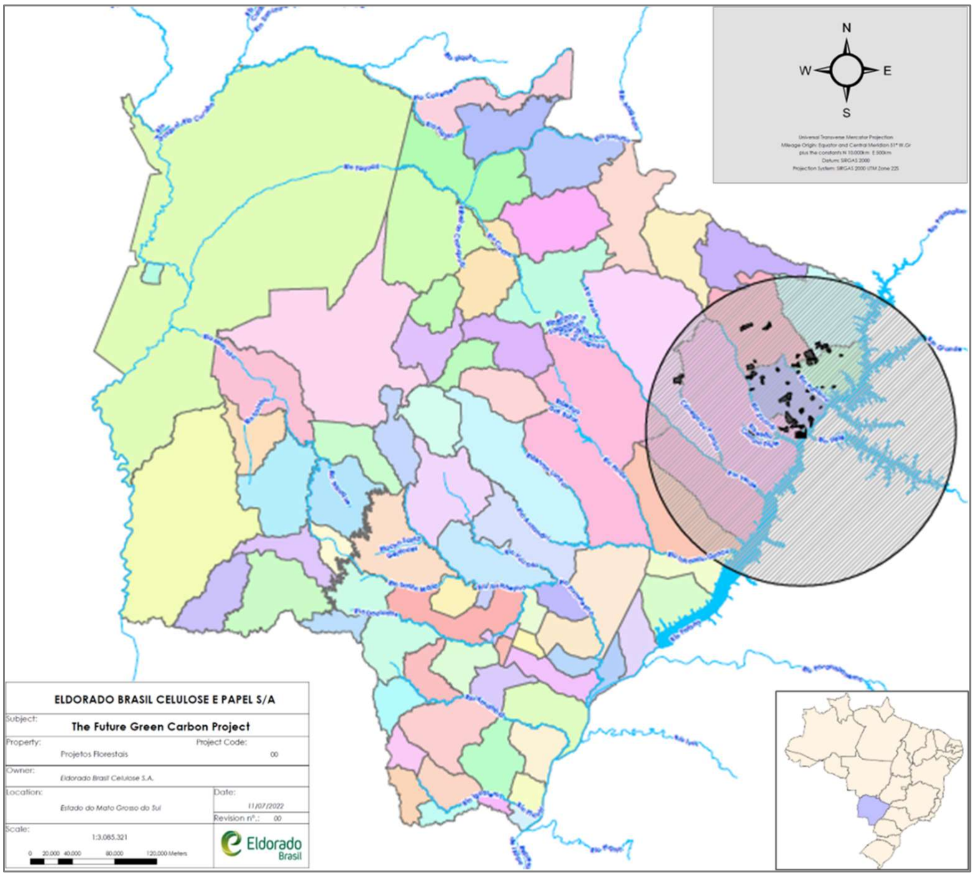
[1] See https://wwf.panda.org/discover/our_focus/food_practice/cerrado_brazil/#:~:text=The%20Cerrado%20is%20home%20to,helping%20to%20limit%20global%20warming.

[2] Oliveira and Pirajá (2021). *Análise multitemporal da cobertura vegetal na Bacia Hidrográfica do Córrego Ceroula, Mato Grosso do Sul. Revista Interações*.

The Amazon and Cerrado together accounted for 90.1% of the deforested area.[3] Mato Grosso do Sul is among the 10 most deforested states in Brazil.

The first instance corresponds to 50 properties (listed further on) and aims to reforest 32,226.25 ha of non-forested land in the Eastern part of Mato Grosso do Sul state. The first plantings started in 04/01/2021 and are estimated to remove approximately 4,203,026.55 tCO_2e[4] on average for the total period of the crediting years (31 years).

Figure 1: location of the "Future Green Carbon Project" areas in the state of Mato Grosso do Sul.



Source: Eldorado

As for its restoration component, the Future Green Carbon Project aims at the sustainable recovery and conservation of nearly 15,000 hectares of native forests located in protection areas. The project's target area is located within the Cerrado biome, the second largest biome in South America, regarded as a global biodiversity hotspot, at times in areas of transition from the Atlantic Forest biome. The project's new plantations will enable the intertwining of fragments of native vegetation through the establishment

[3] Annual Report of Brazilian Deforestation. MapBiomas, 2022.

[4] The LTA, buffer and baseline emissions discount applies.

of ecological corridors. As such, areas that were previously degraded or containing native vegetation cover but isolated will be enhanced, meeting and often surpassing the protection prerequisites of the Brazilian Forestry Code, further strengthening biodiversity.

The project will bring state-of-the-art technology to rural areas and broaden life-perspective opportunities for locals. It is expected to optimize land use while restoring and safeguarding the conservation areas. In addition, all areas under this grouped project must be certified or seek certification under a recognized and high-level market sustainability program, e.g. the FSC, CERFLOR or others, which ensure a balanced approach towards the management of several social and environmental aspects.

1.2 Sectoral Scope and Project Type

This is a grouped project that corresponds to sectoral scope 14 AFOLU-Agriculture, Forestry and Other Land Use, and category ARR-Afforestation, Reforestation and Revegetation.

1.3 Project Eligibility

According to VCS[5], eligible ARR activities "*are those that increase carbon sequestration and/or reduce GHG emissions by establishing, increasing, or restoring vegetative cover (forest or non-forest) through the planting, sowing or human-assisted natural regeneration of woody vegetation. Eligible ARR projects may include timber harvesting in their management plan. The project area shall not be cleared of native ecosystems within the 10-year period prior to the project start date*". Hence, this ARR grouped project is eligible for VCS as its activities:

i. increase carbon sequestration through the establishment of forests in areas previously occupied by grazing activities and/or agriculture;

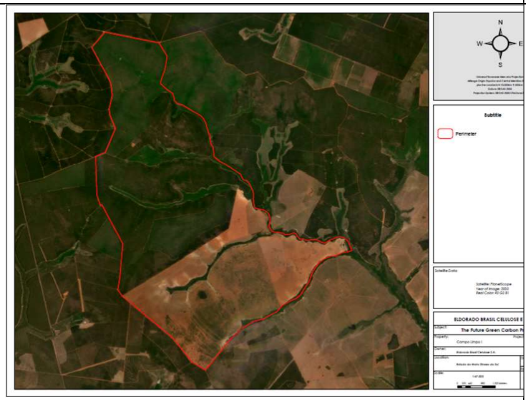
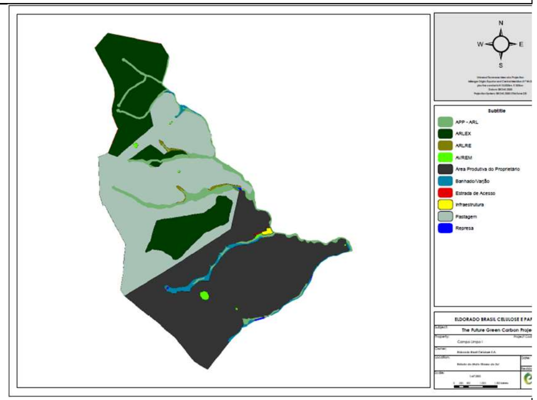
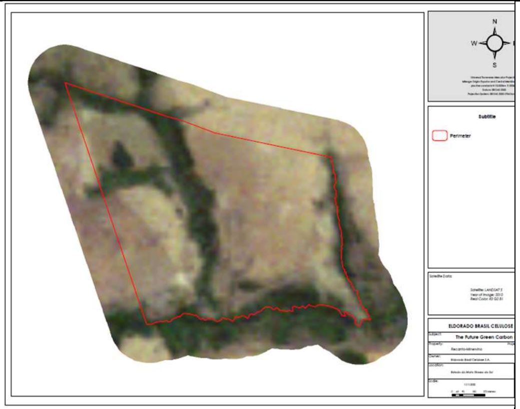
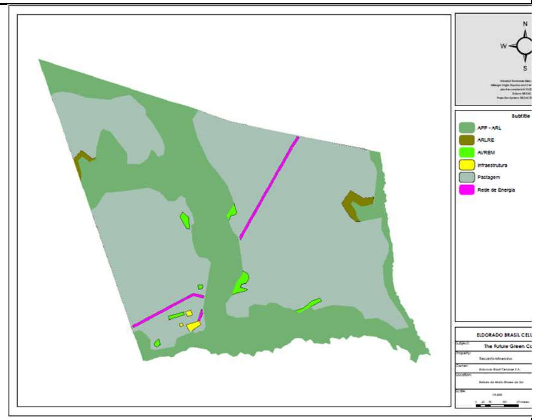
ii. are established in non-forested/agricultural areas with no native ecosystems in the previous 10 years, as shown in the maps below;

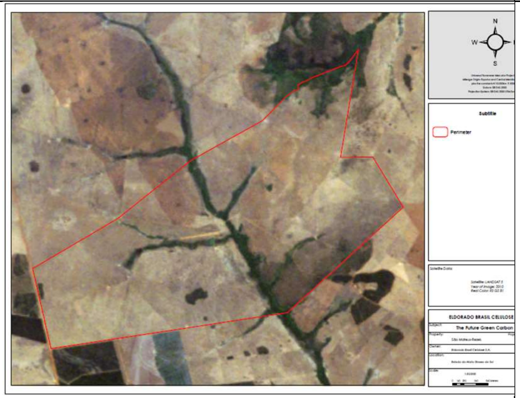
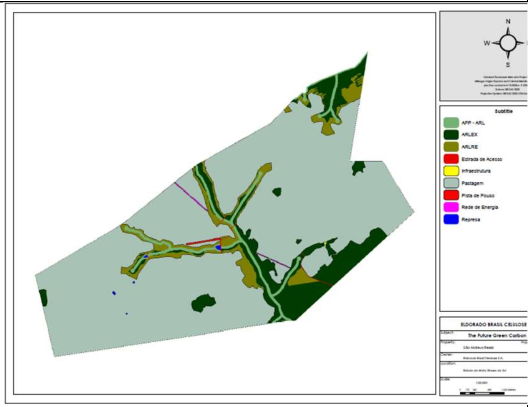
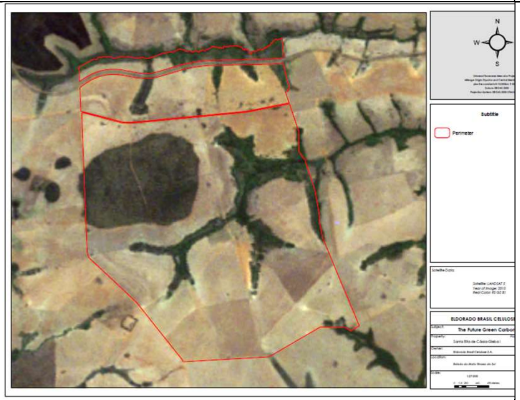
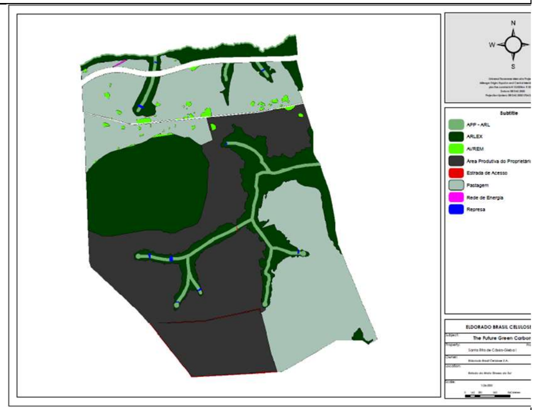
iii. are not developed within a REDD+ jurisdictional program zone. According to VERRA's website, the only JNR project in Brazil is JNR Project 2264 - Jurisdictional Subnational Program for Incentives for Environmental Services of Carbon of the State of ACRE, Brazil – ACRE ISA-Carbon Program[6].

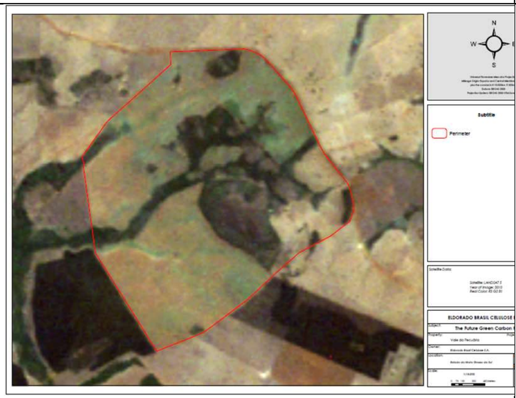
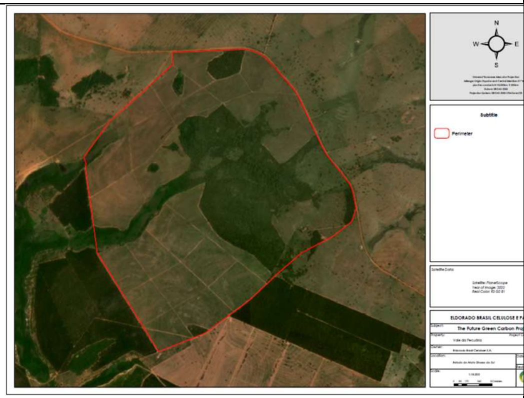
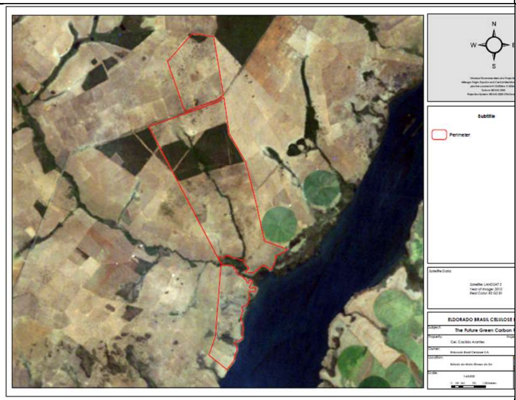
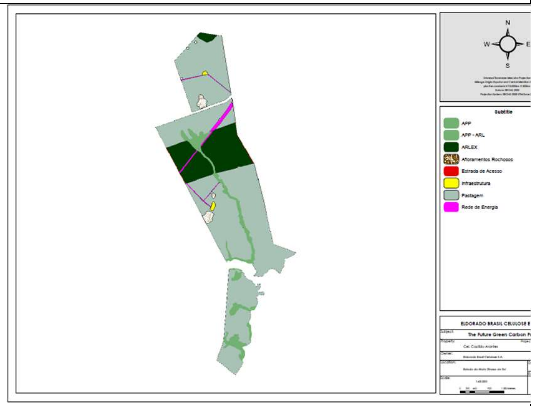
Table 1: maps of the project areas showing land use 10 years prior to the grouped project starting date (2010), before implementation (images from 2020/ 2021) and land-use classification.

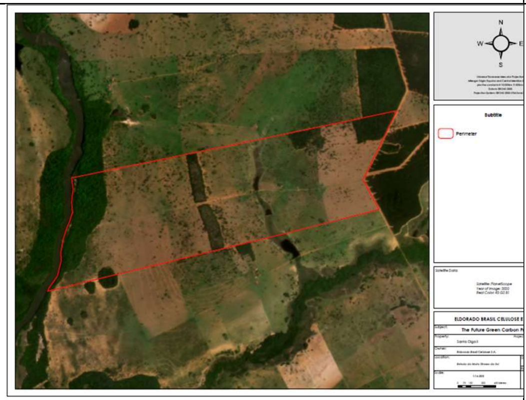
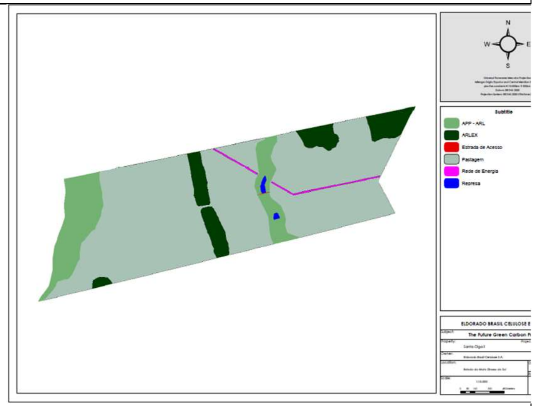
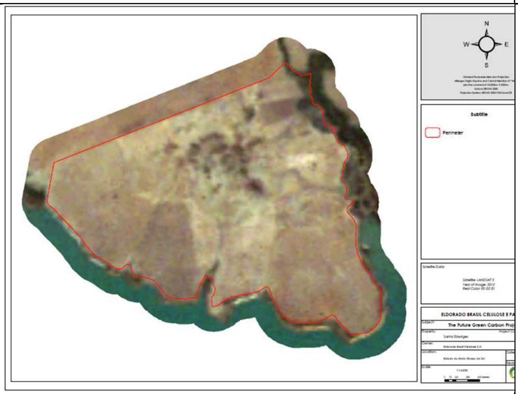
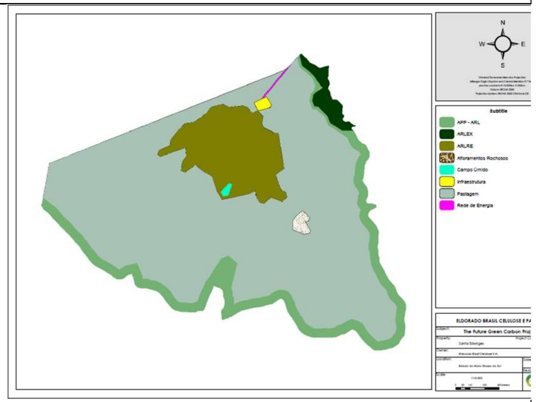
[5] See VCS Standard v.4.4 item A1.1 https://verra.org/wp-content/uploads/2022/12/VCS-Standard-v4.4-FINAL.pdf.

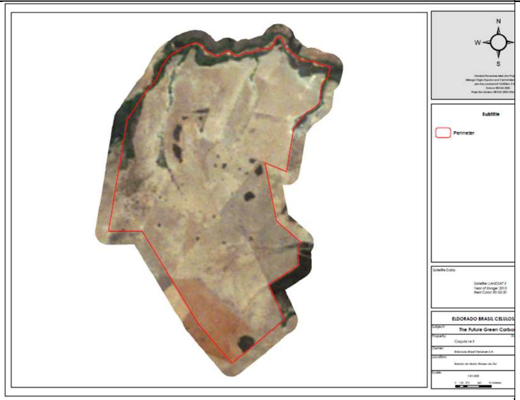
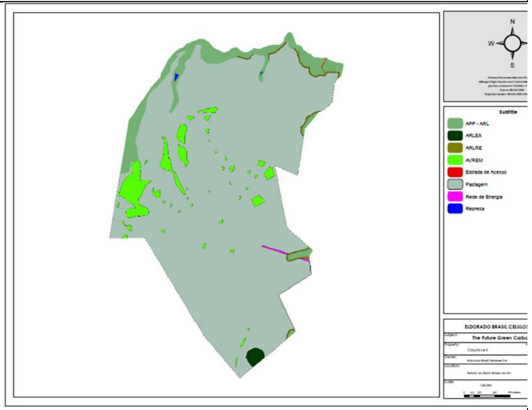
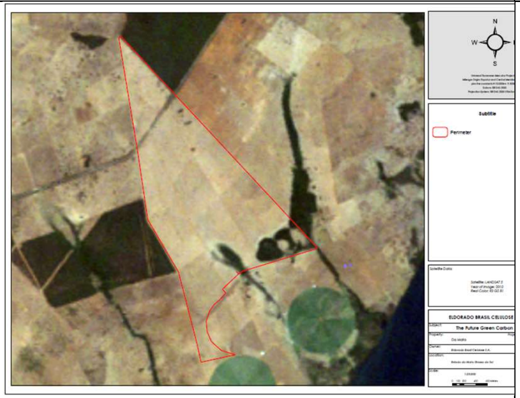
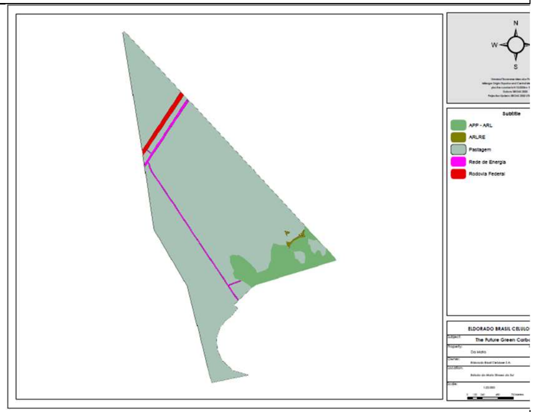
[6] Searched at https://registry.verra.org/app/search/JNR/All%20Projects.

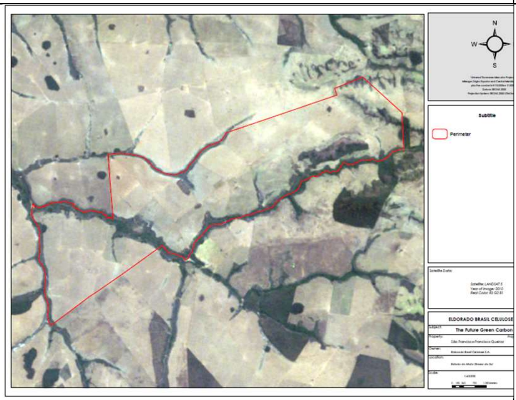
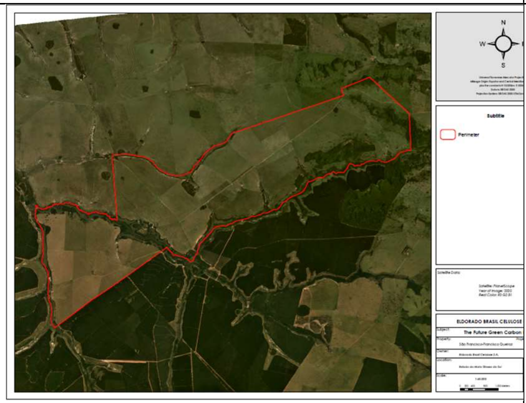
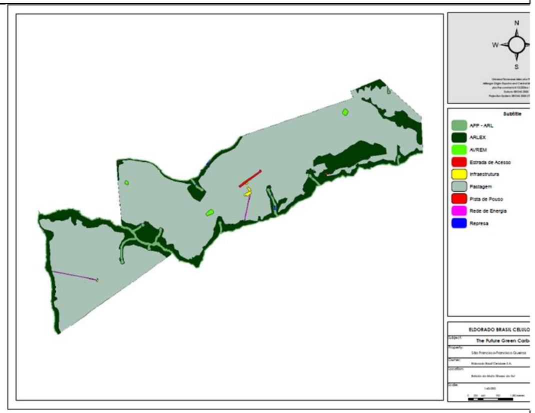
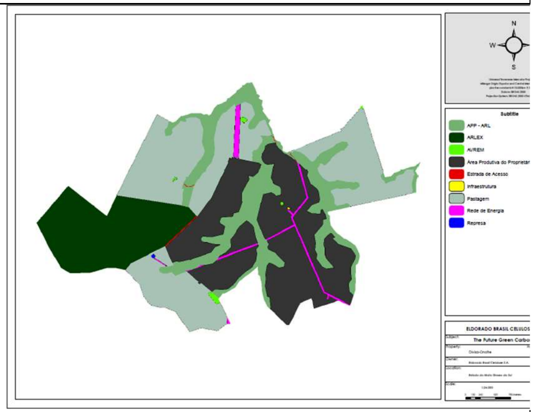
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0009-003-18-0001-00			
0322-003-18-0001-00			

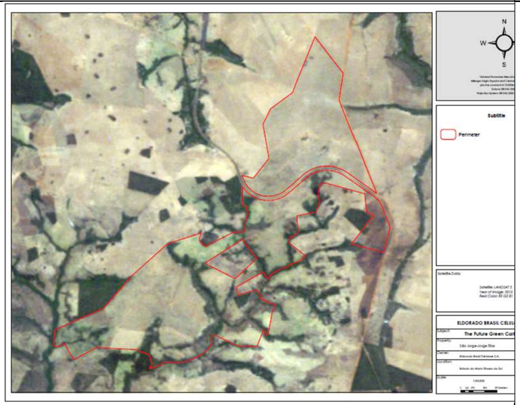
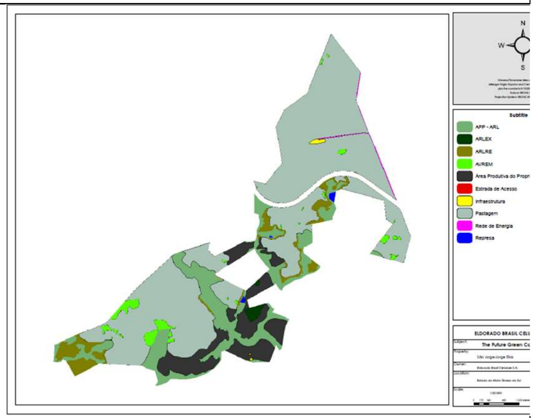
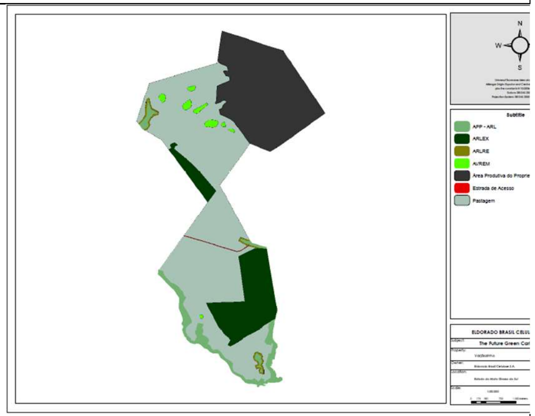
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0357-003-18-0001-00			
0423-003-18-0001-00			

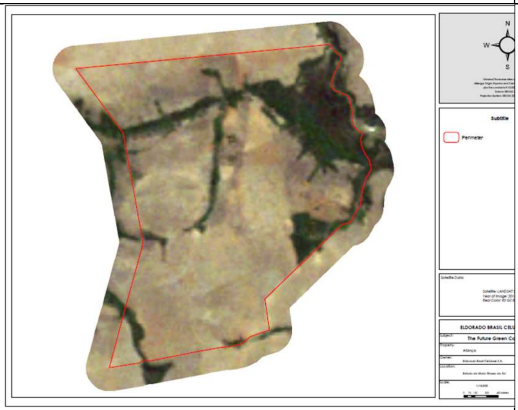
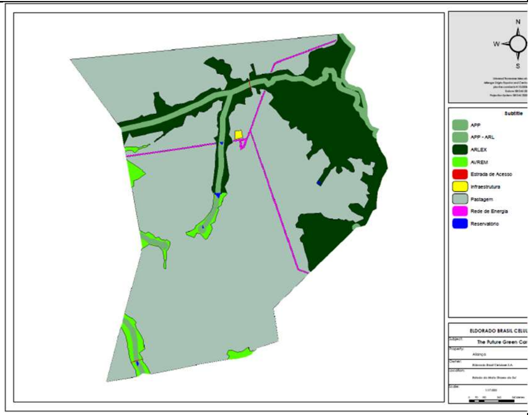
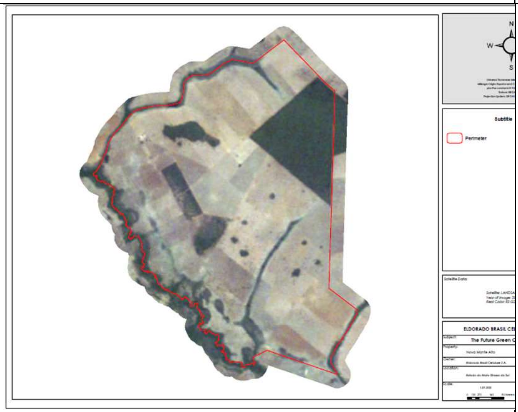
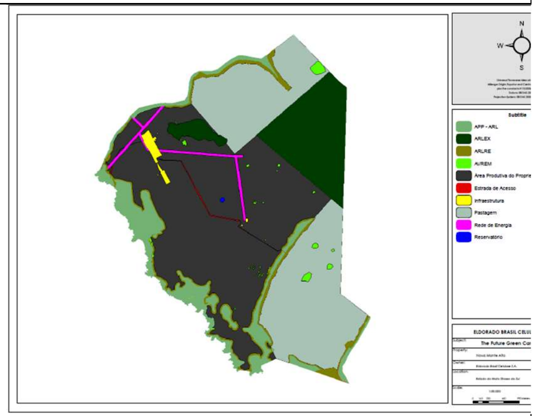
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0574-003-18-0001-00			
0575-003-18-0001-00			

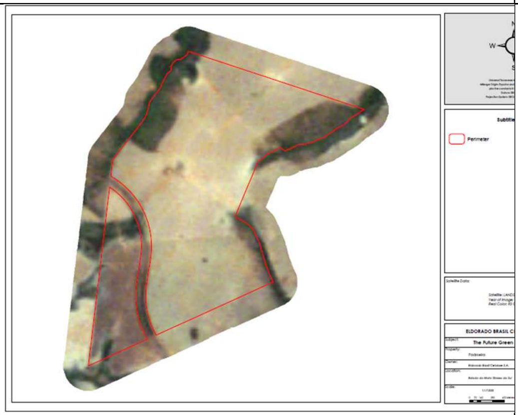
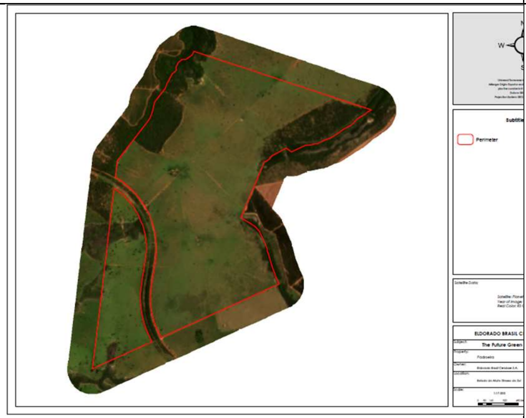
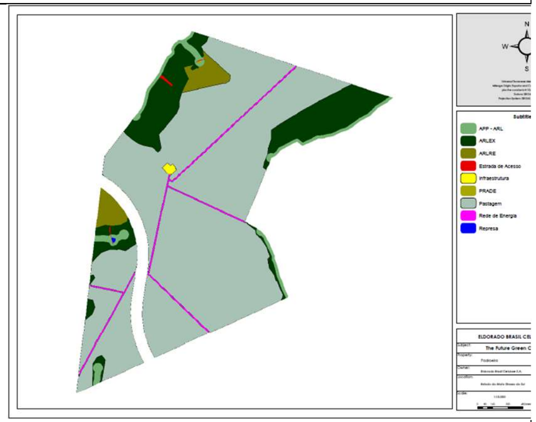
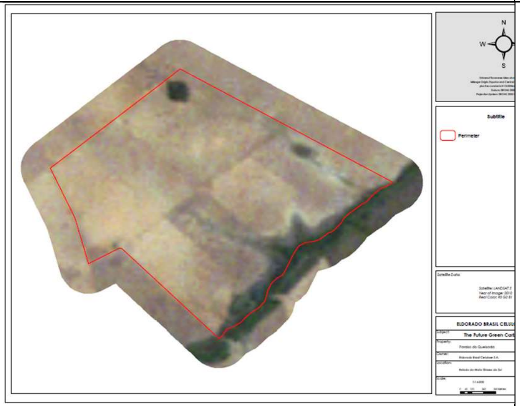
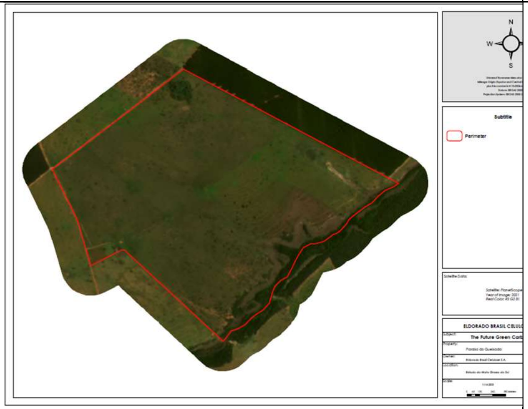
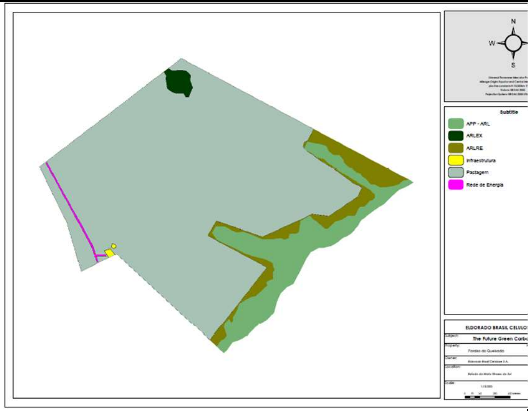
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0576-003-18-0001-00			
0577-003-18-0001-00			

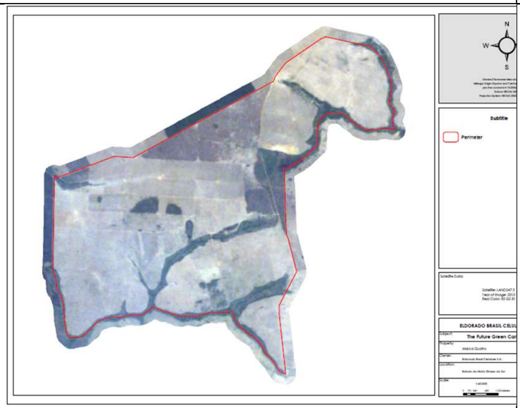
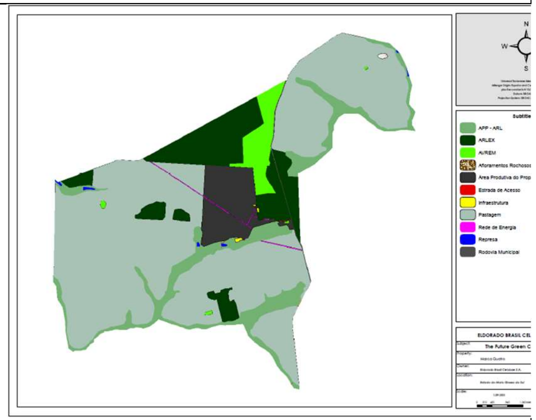
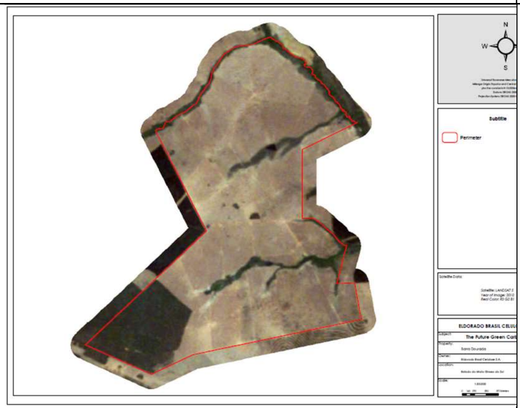
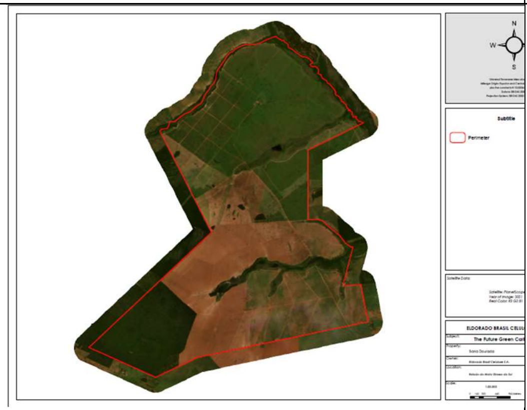
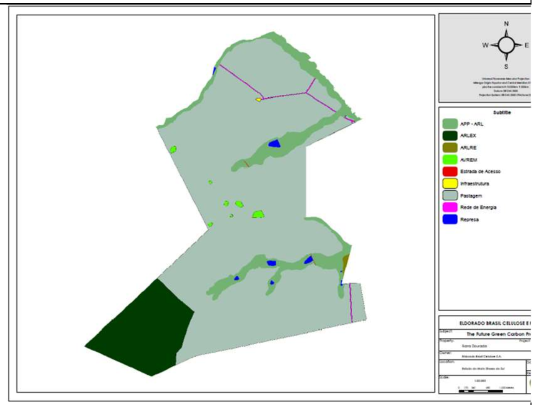
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0578-003-18-0001-00			
0579-003-18-0001-00			

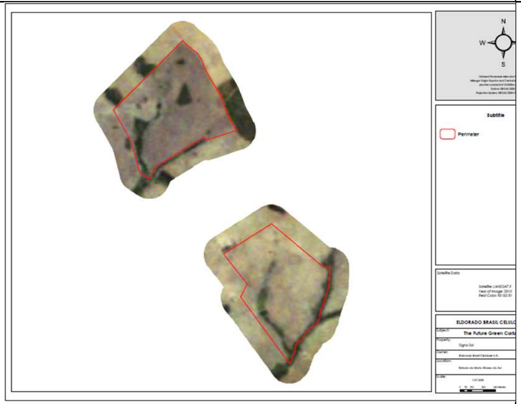
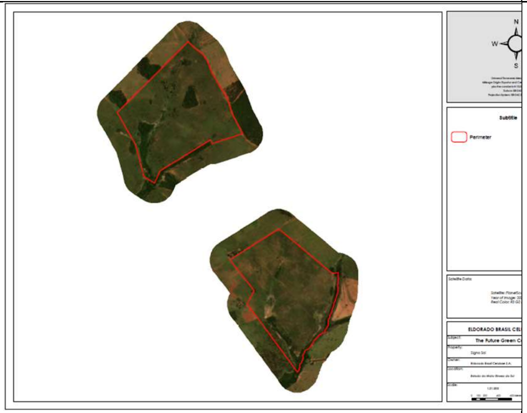
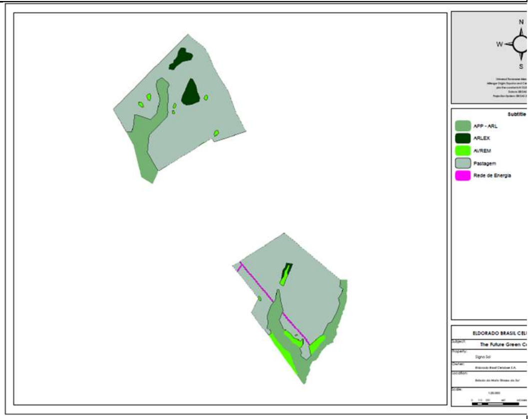
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0581-003-18-0001-00			
0589-003-18-0001-00			

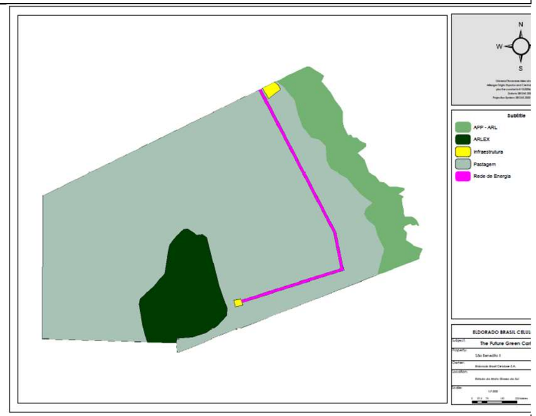
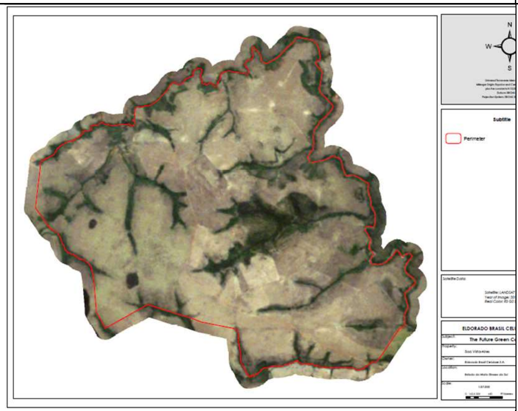
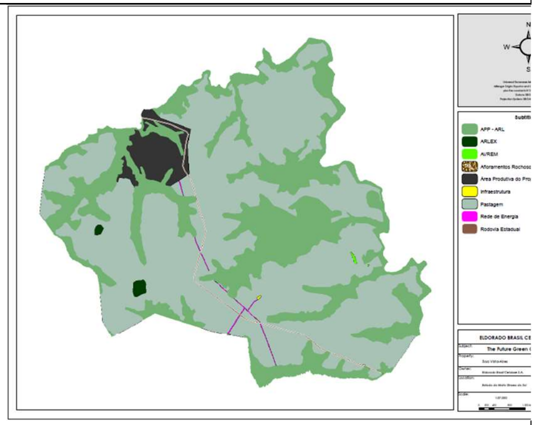
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0592-003-18-0001-00			
0593-003-18-0001-00			

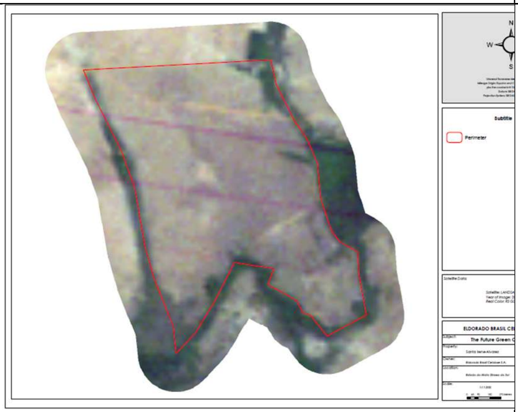
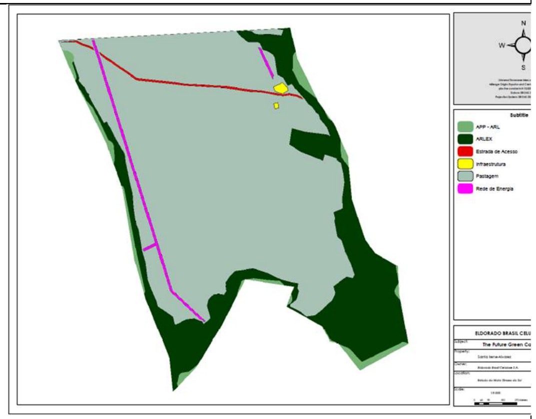
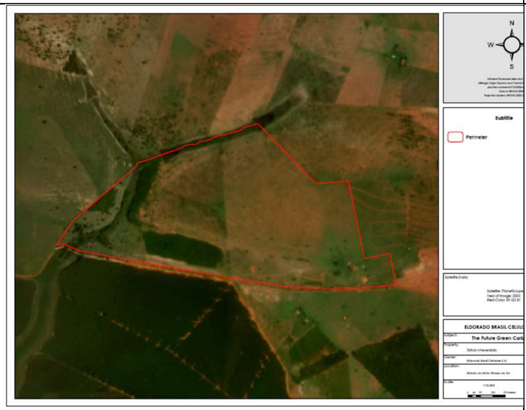
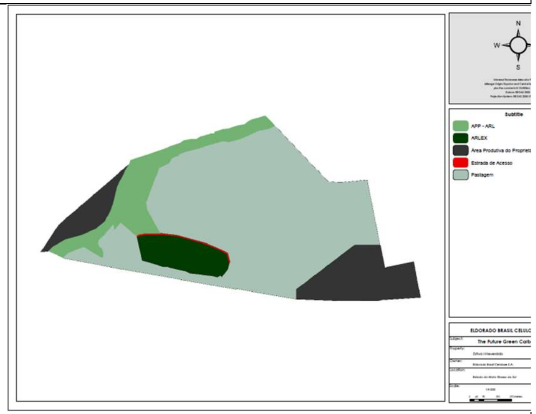
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0594-003-18-0001-00			
0595-003-18-0001-00			

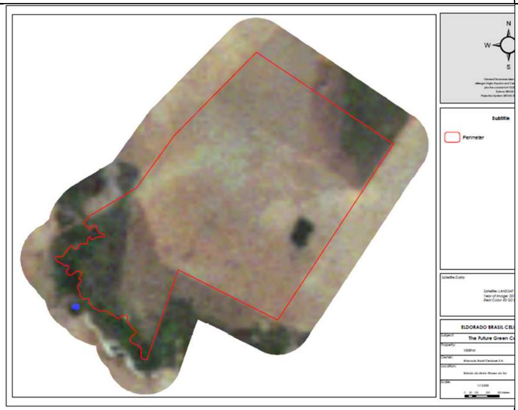
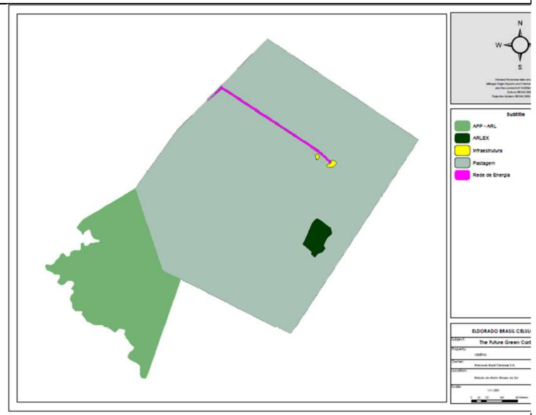
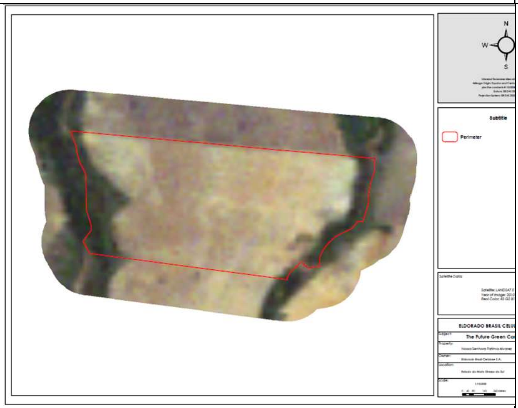
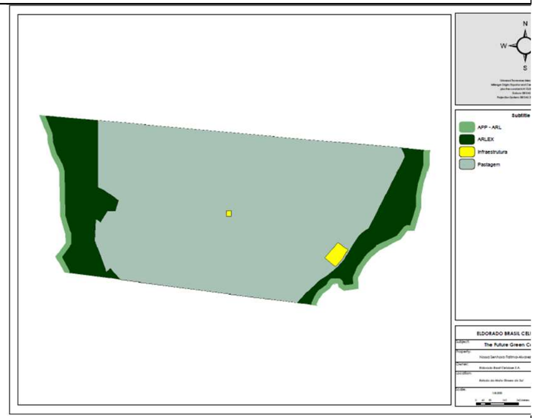
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0596-003-18-0001-00			
0597-003-18-0001-00			

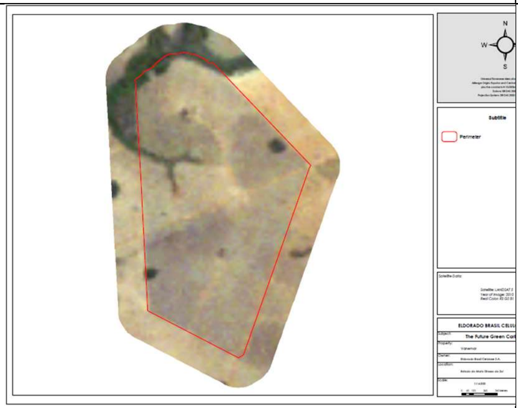
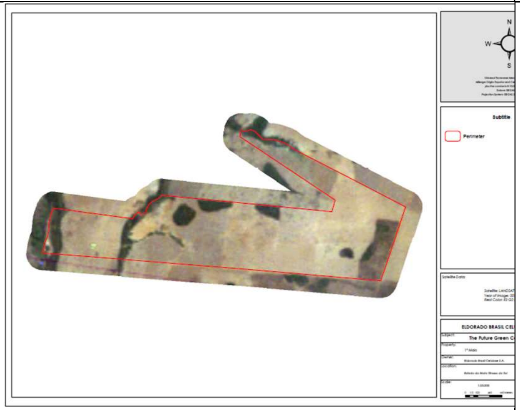
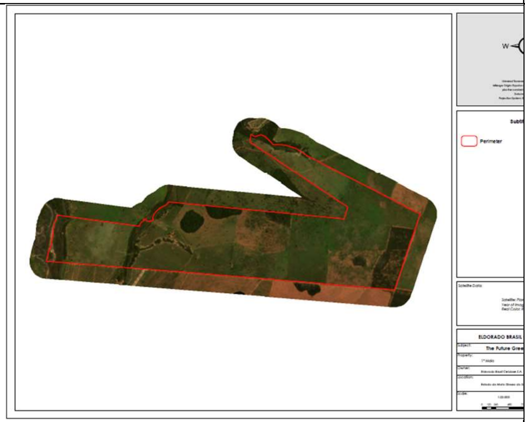
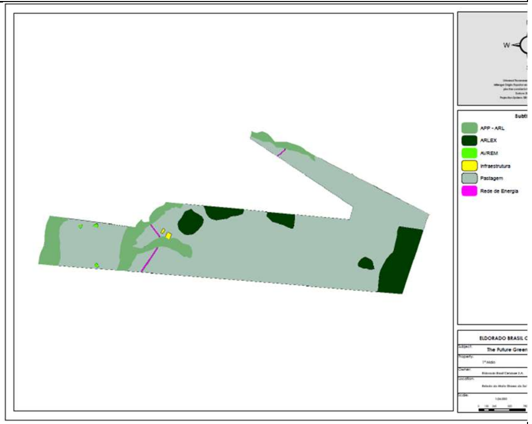
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0598-003-18-0001-00			
0599-003-18-0001-00			

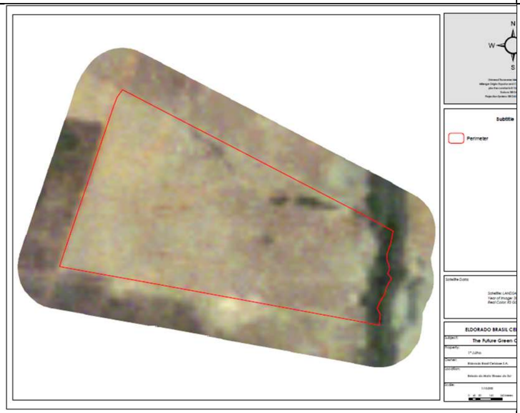
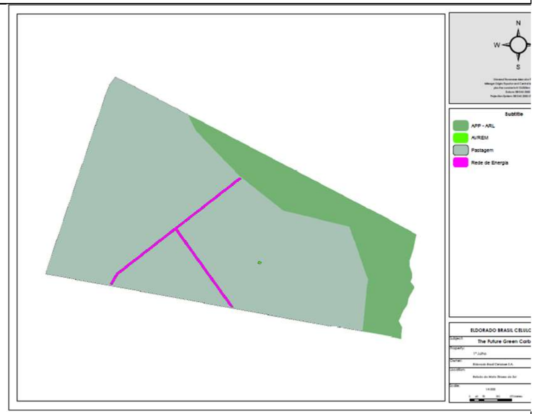
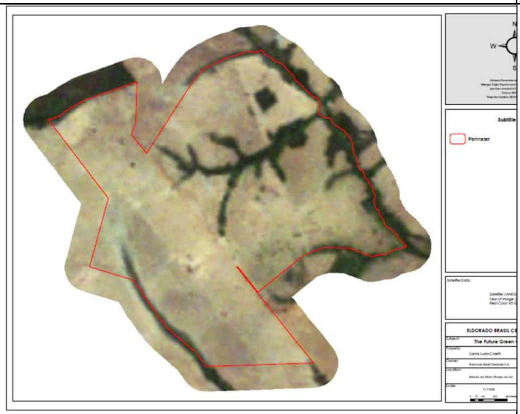
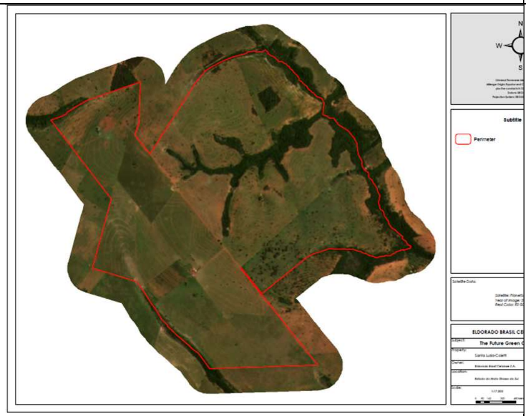
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0600-003-18-0001-00			
0601-003-18-0001-00			

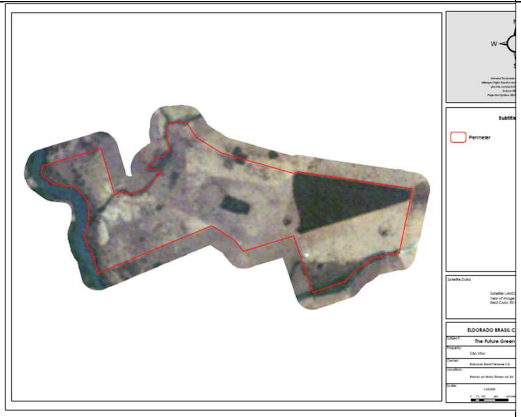
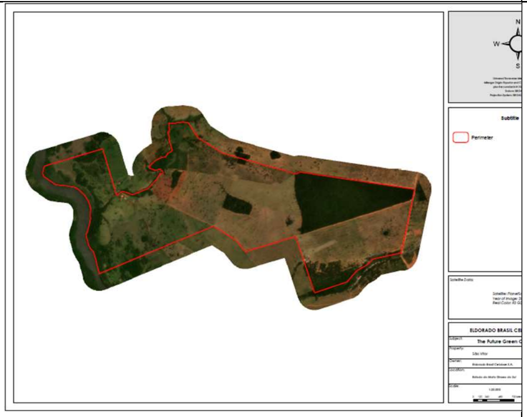
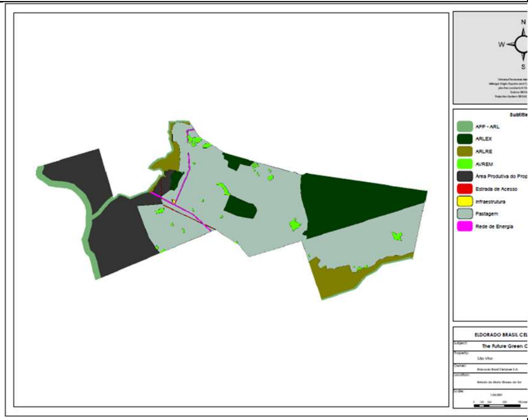
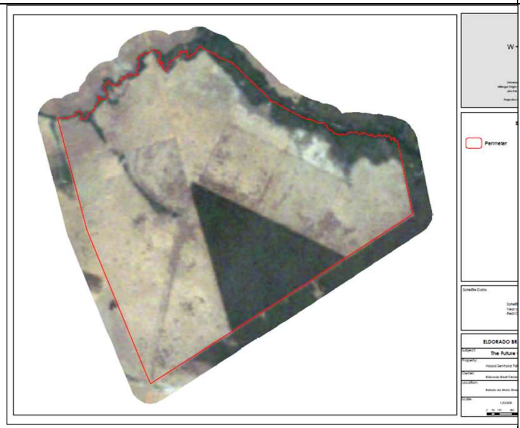
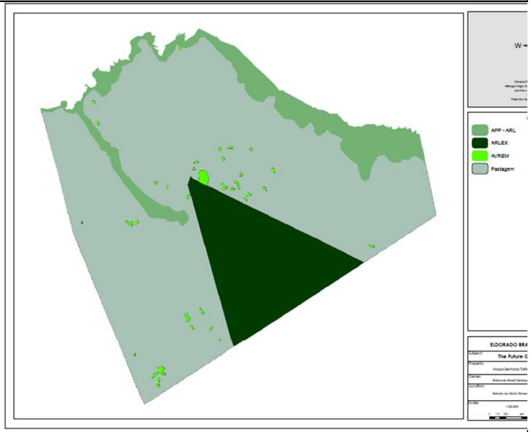
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0602-003-18-0001-00			
0604-003-18-0001-00			

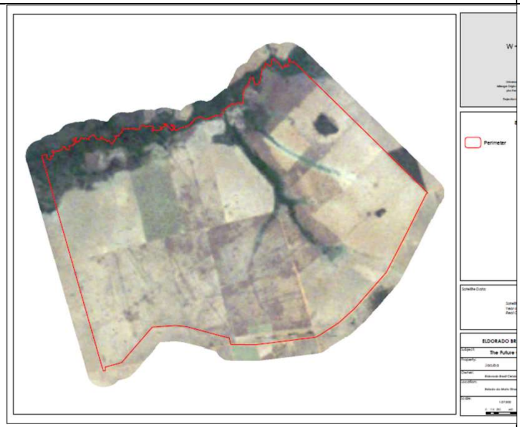
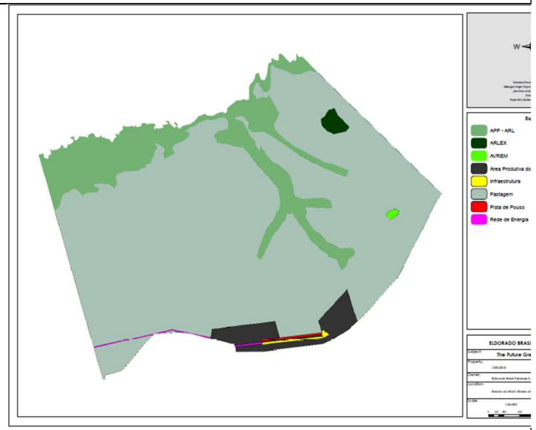
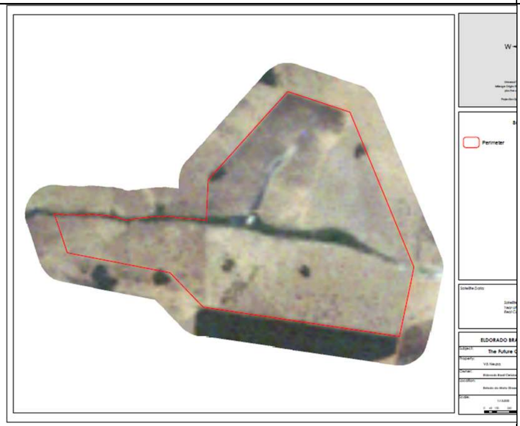
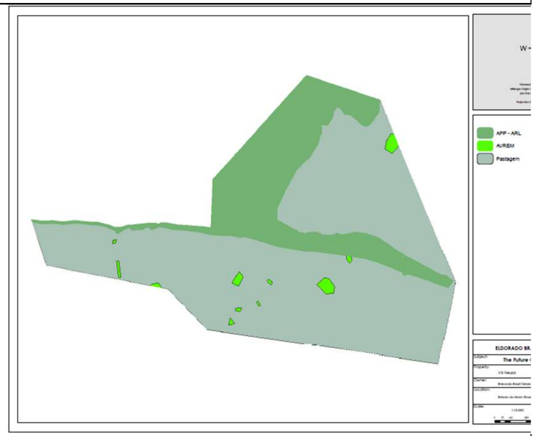
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0630-003-18-0001-00			
0631-003-18-0001-00			

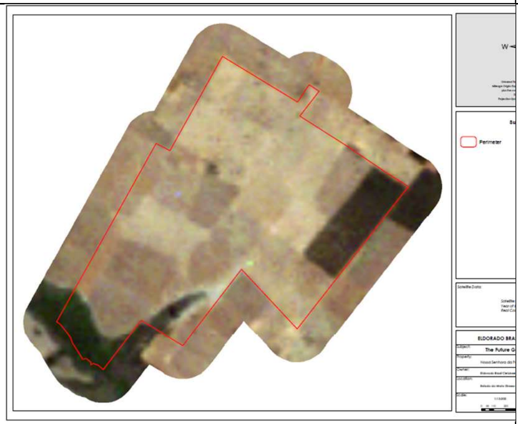
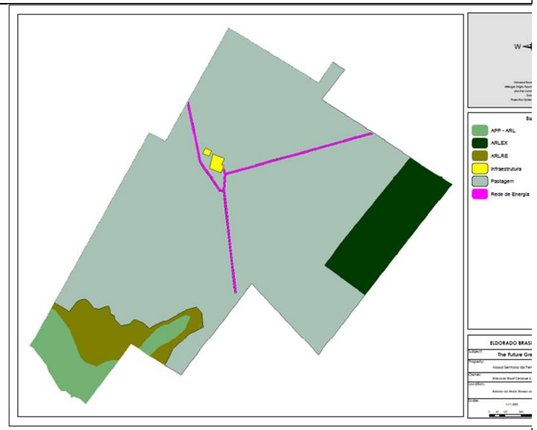
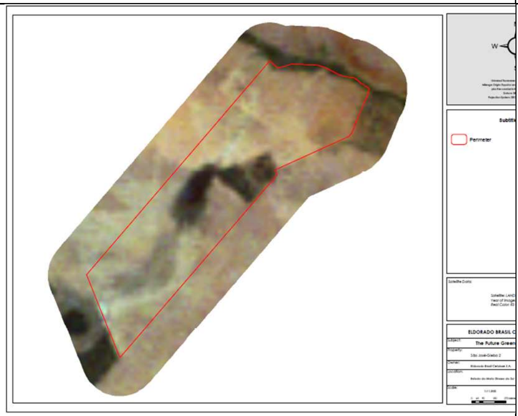
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0632-003-18-0001-00			
0633-003-18-0001-00			

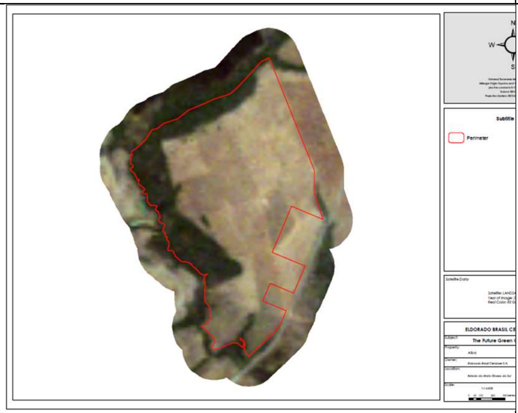
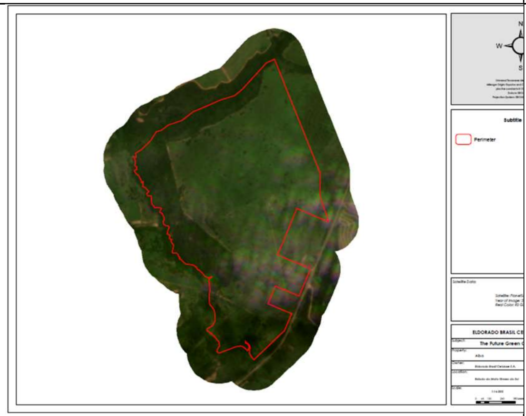
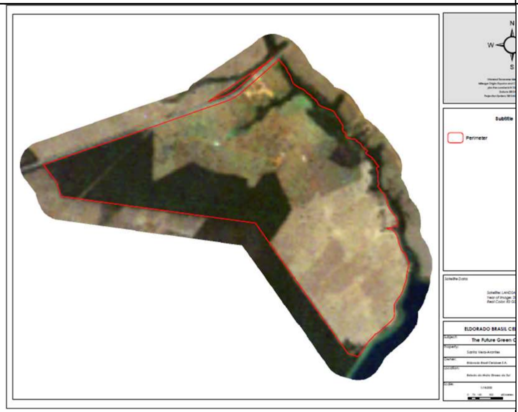
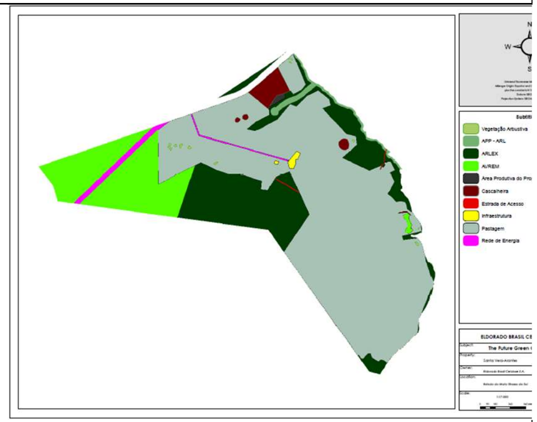
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0634-003-18-0001-00			
0635-003-18-0001-00			

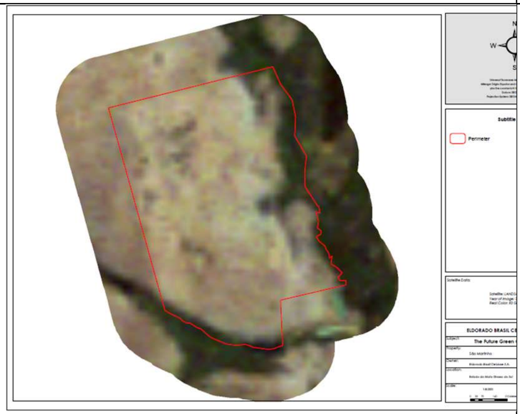
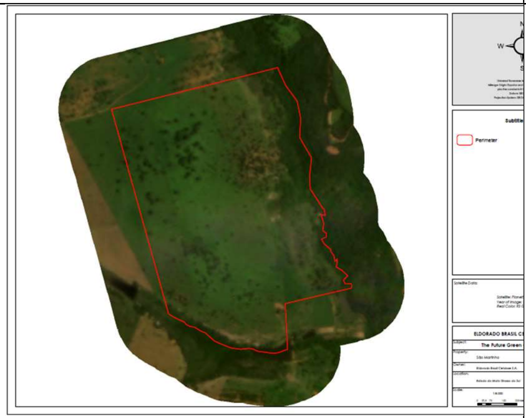
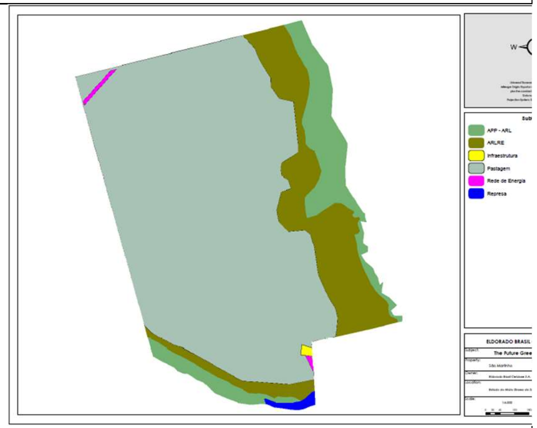
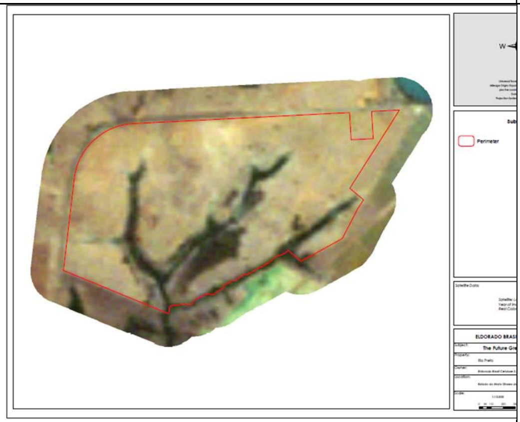
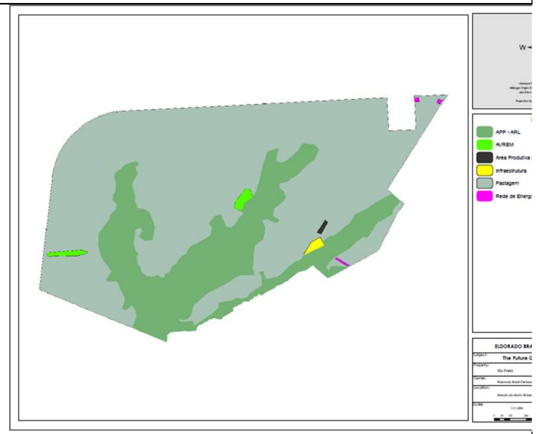
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0636-003-18-0001-00			
0637-003-18-0001-00			

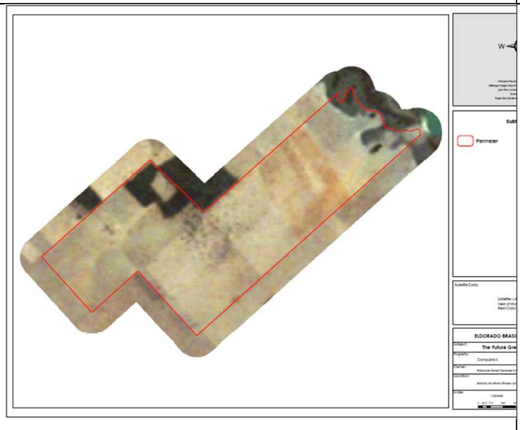
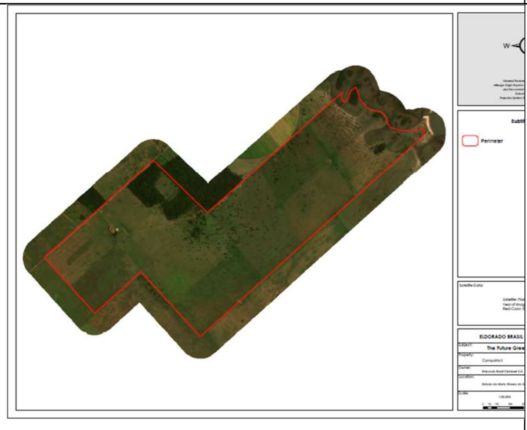
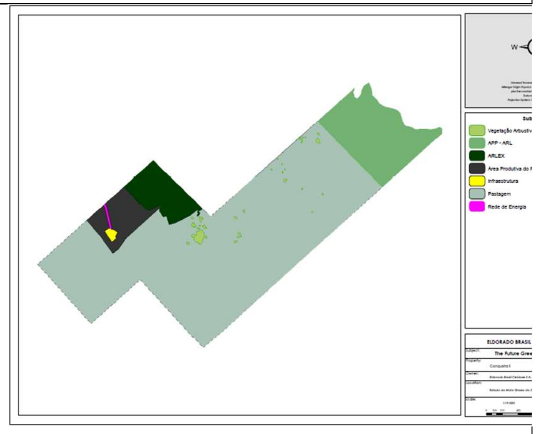
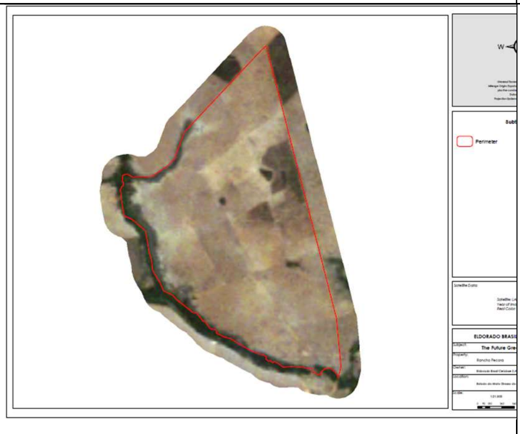
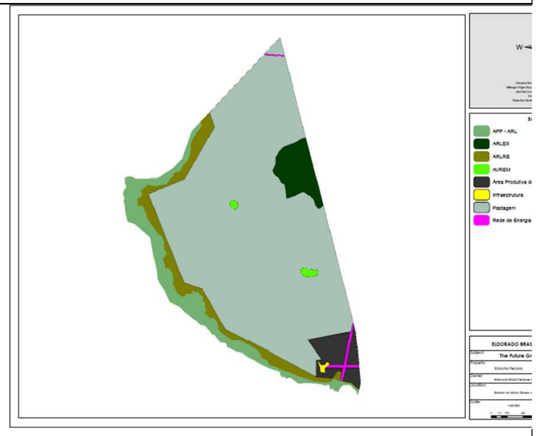
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0638-003-18-0001-00			
0639-003-18-0001-00			

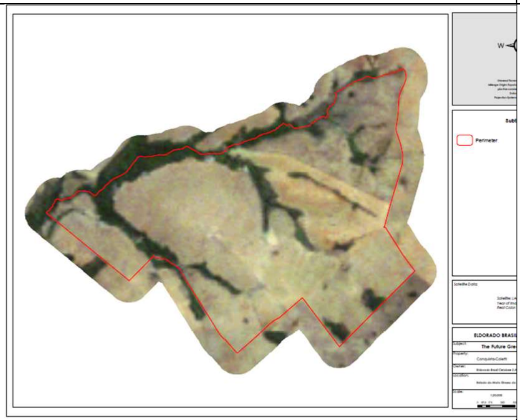
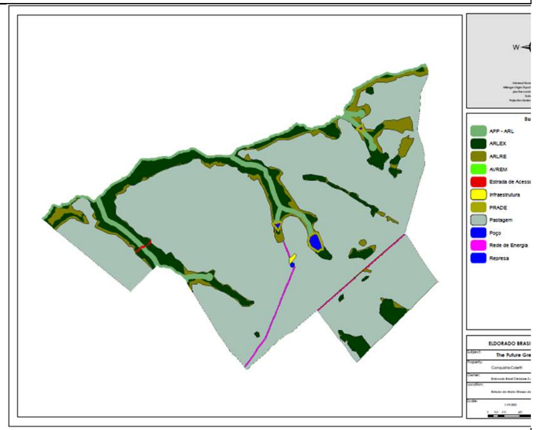
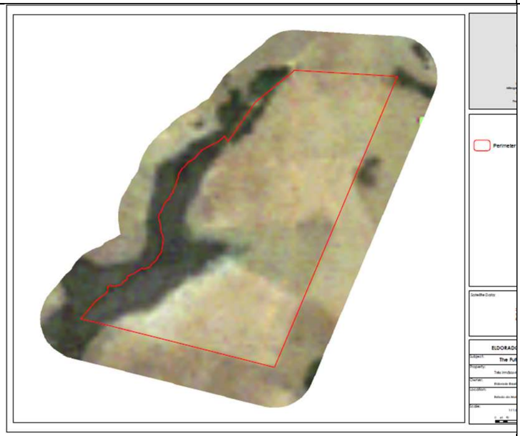
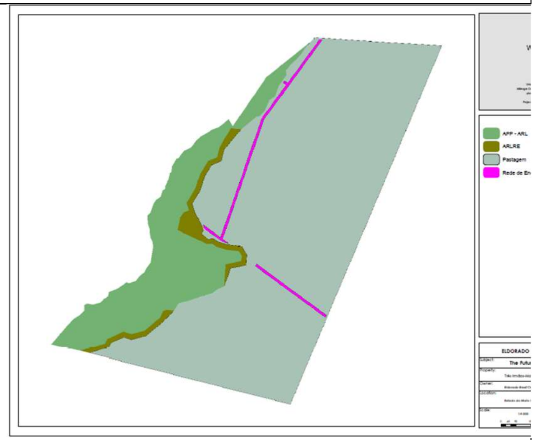
# Far m	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0640-003-18-0001-00			
0641-003-18-0001-00			

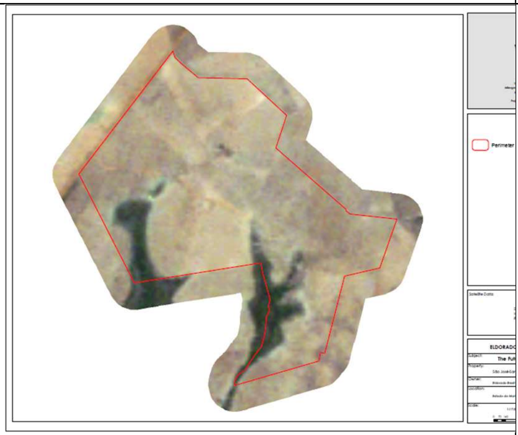
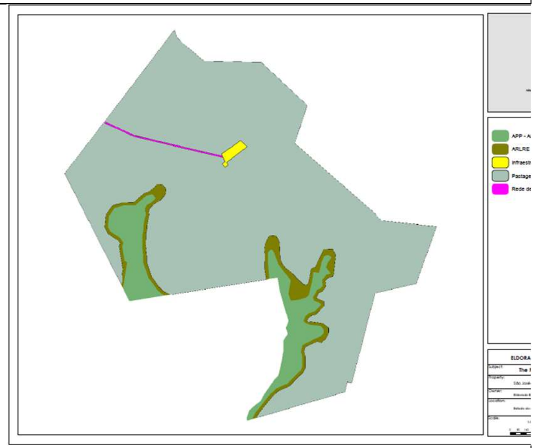
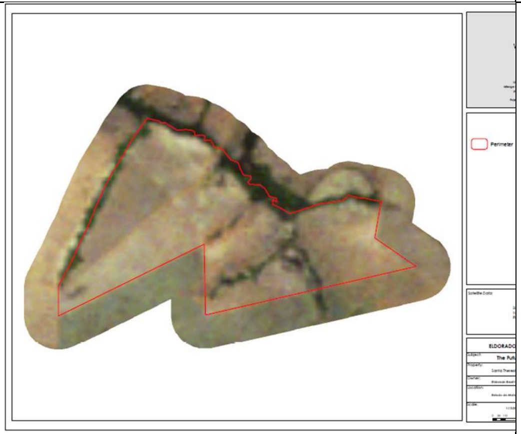
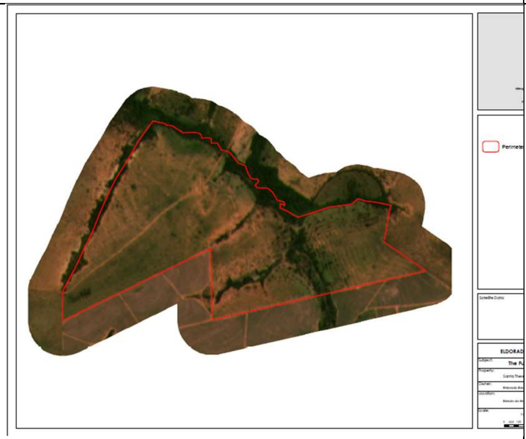
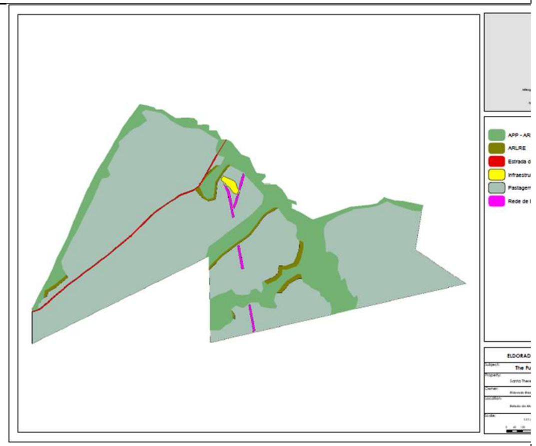
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0642-003-18-0001-00			
0643-003-18-0001-00			

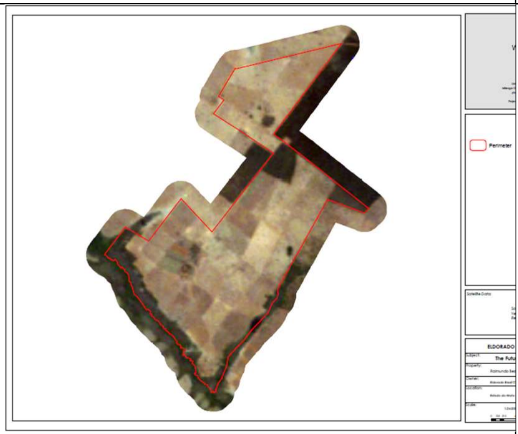
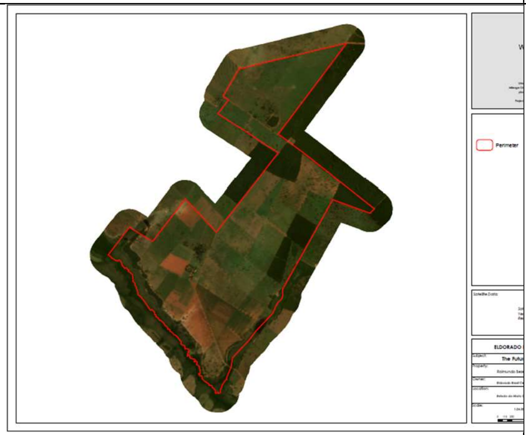
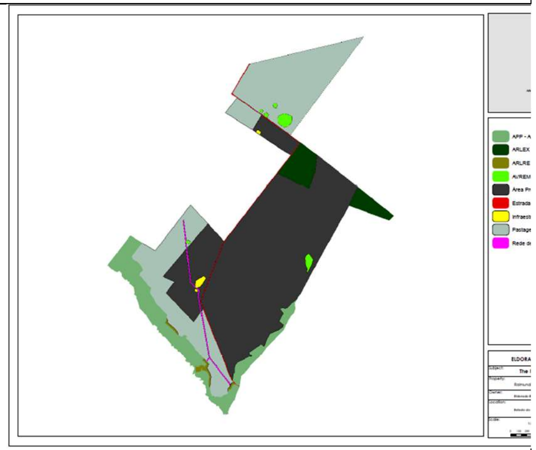
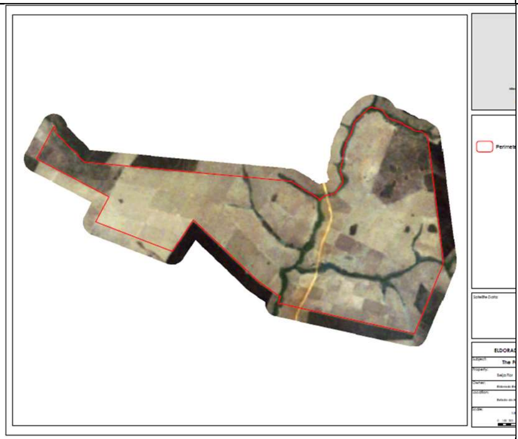
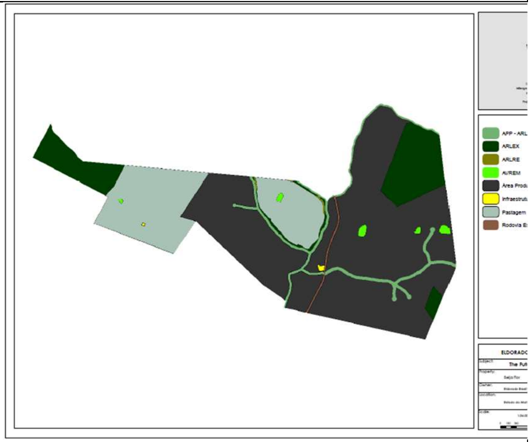
# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0644-003-18-0001-00			
0645-003-18-0001-00			

# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0646-003-18-0001-00			
0647-003-18-0001-00			

# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0648-003-18-0001-00			
0649-003-18-0001-00			

# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0651-003-18-0001-00			
0653-003-18-0001-00			

# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0654-003-18-0001-00			
0657-003-18-0001-00			

# Farm	10 years earlier 2010	Year of image 2020/ 2021	Land-use classification
0659-003-18-0001-00			
0662-003-18-0001-00			

1.4 Project Design

"Future Green Carbon Project" is an AFOLU grouped project that proposes the reforestation of non-forested areas using the *Eucalyptus.spp* genus, especially the species *Eucalyptus urophylla* and hybrid *Eucalyptus urograndis* (*Eucalyptus urophylla* + *Eucalyptus grandis*).

Eligibility Criteria

As per the VCS Standard v.4.4, Grouped Projects requirements, the following statements are provided:

- The grouped project has one clearly defined geographic area within which project activity instances are developed. The geodetic polygon of the Cerrado biome is provided in the supporting project documents folders, as well as in Section 1.12 below;
- The baseline scenario and demonstration of additionality are based upon the initial project activity instances and are described in Section 3;
- The project does not incorporate multiple project activities; A single baseline scenario was determined for the project activity over the entirety of the selected geographic area;
- Demonstration of additionality was determined for the project activity over the entirety of the selected geographic area, that is, the state of Mato Grosso do Sul;
- Relevant factors such as common practice, laws, and policies were used to determine the baseline scenario and demonstration of additionality across the Cerrado biome;
- The initial PAI does not exceed the one percent capacity limit, therefore no clusters were created. The following criteria have been established by the project proponent to assess the eligibility of new Project Activity Instances (PAIs) according to the applicability conditions set out in the VM0009 methodology. Each new PAI must adhere to these requirements using the means of validation provided.

The criteria for including a Project Activity Instance (PAI) into this grouped project are:

1) The proposed PAI must be located within the limits of the state of Mato Grosso do Sul (MS), as per table 3 in section 1.12;
2) Land use cover at the start date of the project activity must be characterized as non-forested land (i.e. the baseline scenario), that is, inter alia, (i) pastureland (dominant presence of grasses e.g. Brachiaria); (ii) degraded pasture (prevalence of grasses e.g. Brachiaria, but with

presence of soil degradation/exposure; (iii) dirty pastureland (dominant presence of grasses e.g. Brachiaria, but with presence of shrubs and isolated trees), (iv) crops.

3) Each PAI must prove the eligibility of the areas where the project will be implemented, according to the provisions of section 1.3 above.
4) Locations where the project will be implemented must be clearly demarcated and georeferenced. This data will clearly show that the project's areas do not overlap.
5) Each project instance must ensure compliance with the methodology's applicability conditions, as per section 3.2 below.
6) Each project instance must confirm the PAI's starting date, that is, the date on which the site preparation or planting activities began, e.g. using registration in the company's forestry system identifying project and plot, providing plot relevant information such as area in hectares and starting date of planting.
7) Each project instance must evidence the use and application of the specified technologies or measures presented in section 1.11, e.g. through the Management Plan for the area, informing on land regularization, location of preservation areas and/or any environmental certification (e.g. FSC).
8) The Project Proponent must assess all proposed areas for implementation of the grouped project to determine whether there has been/will be displacement of agricultural activity to a new area, as per provisions in sections 1.7 and 4.3 below.

The baseline scenario and demonstration of additionality assessed in section 3 below are based upon the initial project activity instances and were determined for the project activity over the entirety of the selected geographic area, that is, the state of Mato Grosso do Sul, except the Pantanal areas. Hence, each proposed new instance that complies with all the above eligibility criteria prove to be coherent with the elements raised in the additionality assessment and, therefore, are deemed additional and subject to the identified baseline scenario under this grouped project.

1.5 Project Proponent

Organization name	Eldorado Brasil Celulose S/A
Contact person	Mr. Fabio José de Paula
Title	Sustainability manager
Address	Av. Marginal Direita do Tietê, 500 - Vila Jaguara, São Paulo - SP 05118-100 - Brazil

Telephone	+55 (67)99634-3800
Email	fabio.paula@eldoradobrasil.com.br

1.6 Other Entities Involved in the Project

There is no other entity involved in the proposed grouped project.

1.7 Ownership

Eldorado is the Project Proponent, project owner, leaseholder, forests' owner and, in some cases, the landowner. It will demonstrate its legal right to control and operate the grouped project's activities by:

- Lease agreements (Lease Deeds) signed between Eldorado and the landowner partners.
- Property deeds registered at the Land Registry attesting ownership of land.

The Future Green Carbon Project's first instance will comprise 50 properties, leased or owned by Eldorado, all of which secured by its respective legal documents.

Table 2: information on the project's properties

ID CODE # Farm	TYPE	PROPERTY NAME	MUNICIPALITY	LEASE AGREEMENT/ PROPERTY DEED	DOCUMENT	DATE
0009-003-18-0001-00	Partnership	Campo Limpo I	Três Lagoas	5231	Contract	01/07/2022
0322-003-18-0001-00	Partnership	Recanto-Minervino	Inocência	5013	Contract	03/03/2022
0357-003-18-0001-00	Lease	São Mateus Rezek	Selvíria	1156	Contract	12/01/2021
0423-003-18-0001-00	Lease	Santa Rita de Cássia	Aparecida do Taboado	1232	Contract	24/01/2022
0574-003-18-0001-00	Lease	Vale da Pecuária	Selvíria	1341	Contract	15/09/2019
0575-003-18-0001-00	Lease	Cel. Cacildo Arantes	Selvíria	1343	Contract	14/10/2019
0576-003-18-0001-00	Lease	Santa Olga II	Selvíria	1344	Contract	06/09/2019
0577-003-18-0001-00	Lease	Santa Edwirges	Aparecida do Taboado	1345	Contract	28/10/2019
0578-003-18-0001-00	Lease	Caçula I e II	Selvíria	1346	Contract	13/09/2019
0579-003-18-0001-00	Lease	Da Mata	Selvíria	1347	Contract	16/12/2019

ID CODE # Farm	TYPE	PROPERTY NAME	MUNICIPALITY	LEASE AGREEMENT/ PROPERTY DEED	DOCUMENT	DATE
0581-003-18-0001-00	Lease	São Francisco-Francisco Queiroz	Inocência	1351	Contract	18/11/2019
0589-003-18-0001-00	Lease	Divisa-Onofre	Paranaíba	1353	Contract	11/02/2020
0592-003-18-0001-00	Lease	São Jorge-Jorge Elias	Inocência	1361	Contract	27/02/2020
0593-003-18-0001-00	Lease	Varjãozinho	Selvíria	1355	Contract	27/02/2020
0594-003-18-0001-00	Lease	Aliança	Aparecida do Taboado	1367	Contract	02/03/2020
0595-003-18-0001-00	Lease	Nova Monte Alto	Três Lagoas	1365	Contract	02/09/2020
0596-003-18-0001-00	Lease	Padroeira	Inocência	1352	Contract	03/09/2020
0597-003-18-0001-00	Lease	Paraiso do Queixada	Selvíria	1359	Contract	31/08/2020
0598-003-18-0001-00	Lease	Marca Quatro	Água Clara	1374	Contract	31/08/2020
0599-003-18-0001-00	Lease	Barra Dourada	Três Lagoas	1371	Contract	16/09/2020
0600-003-18-0001-00	Lease	Signo Sol	Paranaíba	1357	Contract	30/09/2020
0601-003-18-0001-00	Lease	São Luiz-Antenor (Santa Rosa)	Aparecida do Taboado	1369	Contract	30/09/2020
0602-003-18-0001-00	Lease	São Benedito II	Três Lagoas	1375	Contract	28/08/2020
0604-003-18-0001-00	Lease	Boa Vista-Aires	Inocência	1358	Contract	31/08/2020
0630-003-18-0001-00	Partnership	Santa Irene-Alvarez	Inocência	4406	Contract	15/12/2021
0631-003-18-0001-00	Lease	Estiva I	Aparecida do Taboado	4395	Contract	15/12/2021
0632-003-18-0001-00	Partnership	Idalina	Aparecida do Taboado	4406	Contract	15/12/2022
0633-003-18-0001-00	Partnership	Nossa Senhora Fatima-Alvarez	Aparecida do Taboado	4406	Contract	15/12/2021
0634-003-18-0001-00	Partnership	Vanemar	Aparecida do Taboado	4667	Contract	05/01/2022
0635-003-18-0001-00	Partnership	1º Maio	Aparecida do Taboado	4401	Contract	15/12/2021
0636-003-18-0001-00	Partnership	1º Julho	Aparecida do Taboado	4401	Contract	15/12/2021
0637-003-18-0001-00	Partnership	Santa Luzia-Coletti	Aparecida do Taboado	4579	Contract	03/01/2022
0638-003-18-0001-00	Partnership	São Vitor	Selvíria	4913	Contract	20/12/2021
0639-003-18-0001-00	Partnership	Nossa Senhora Fatima-Claudio Franco	Selvíria	4881	Contract	29/12/2021
0640-003-18-0001-00	Partnership	Jacuba	Inocência	4881	Contract	29/12/2021
0641-003-18-0001-00	Partnership	Vó Neuza	Selvíria	4881	Contract	29/12/2021
0642-003-18-0001-00	Partnership	Nossa Senhora da Penha	Selvíria	4749	Contract	12/05/2022
0643-003-18-0001-00	Eldorado Brasil	São José Gleba II	Selvíria	59.585	Property deed	09/06/2022
0644-003-18-0001-00	Partnership	Alba	Selvíria	5008	Contract	24/03/2022

ID CODE # Farm	TYPE	PROPERTY NAME	MUNICIPALITY	LEASE AGREEMENT/ PROPERTY DEED	DOCUMENT	DATE
0645-003-18-0001-00	Partnership	Santa Vera	Três Lagoas	5009	Contract	24/03/2022
0646-003-18-0001-00	Partnership	São Martinho	Selvíria	5013	Contract	03/03/2022
0647-003-18-0001-00	Partnership	Rio Preto	Aparecida do Taboado	5037	Contract	01/07/2022
0648-003-18-0001-00	Partnership	Conquista II	Selvíria	4912	Contract	23/03/2022
0649-003-18-0001-00	Partnership	Rancho Pecora	Selvíria	5033	Contract	13/05/2022
0651-003-18-0001-00	Partnership	Conquista-Coletti	Paranaíba	4969	Contract	03/01/2022
0653-003-18-0001-00	Partnership	Três Irmãos	Paranaíba	5109	Contract	02/06/2022
0654-003-18-0001-00	Partnership	São José	Selvíria	5119	Contract	12/04/2022
0657-003-18-0001-00	Partnership	Santa Therezinha	Aparecida do Taboado	5170	Contract	12/04/2022
0659-003-18-0001-00	Lease	Raimundo Bezerra	Selvíria	5158	Contract	13/04/2022
0662-003-18-0001-00	Partnership	Beija-Flor	Três Lagoas	5181	Contract	26/05/2022

1.8 Project Start Date

The grouped project starting date is 04/01/2021, which is the date of the first plantings.

1.9 Project Crediting Period

According to VCS Standard v.4.4, "*the project crediting period shall be a minimum of 20 years up to a maximum of 100 years, which may be renewed at most four times with a total project crediting period not to exceed 100 years*".

Therefore, the first crediting period for this grouped project is 31 years, starting in 04/01/2021, which is the date of the first plantings, lasting until 03/01/2052 and could be renewed up to 100 years, lasting until 03/01/2121.

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)
2021	420,321.10
2022	1,527,173.25
2023	3,362,910.09
2024	5,505,885.82
2025	7,494,736.62
2026	9,061,707.60
2027	10,146,096.19
2028	4,451,552.11
2029	3,404,623.96
2030	3,362,910.09
2031	5,505,885.82
2032	7,494,736.62
2033	9,061,707.60
2034	10,146,096.19
2035	4,451,552.11
2036	3,404,623.96
2037	3,362,910.09
2038	5,505,885.82
2039	7,494,736.62
2040	9,061,707.60
2041	10,146,096.19
2042	4,451,552.11
2043	3,404,623.96
2044	3,362,910.09
2045	5,505,885.82

2046	7,494,736.62
2047	9,061,707.60
2048	10,146,096.19
2049	4,451,552.11
2050	3,404,623.96
2051	3,362,910.09
Total estimated ERs	4,203,026.55
Total number of crediting years	31
Average annual ERs	135,581.50

Note: This ex ante corresponds to the expected total GHG benefit for the project scenario (LTA), with a buffer discount of 24%, the baseline emission discount related to the pre-existing trees and the rating discount of 3%.

As an ARR grouped project that includes harvesting, the loss of carbon due to harvesting shall be included in the quantification of project emissions and is calculated following the equation provided in VCS Standard v.4.4. The long-term average GHG benefit is estimated as 4,203,026.55 t CO_2e.

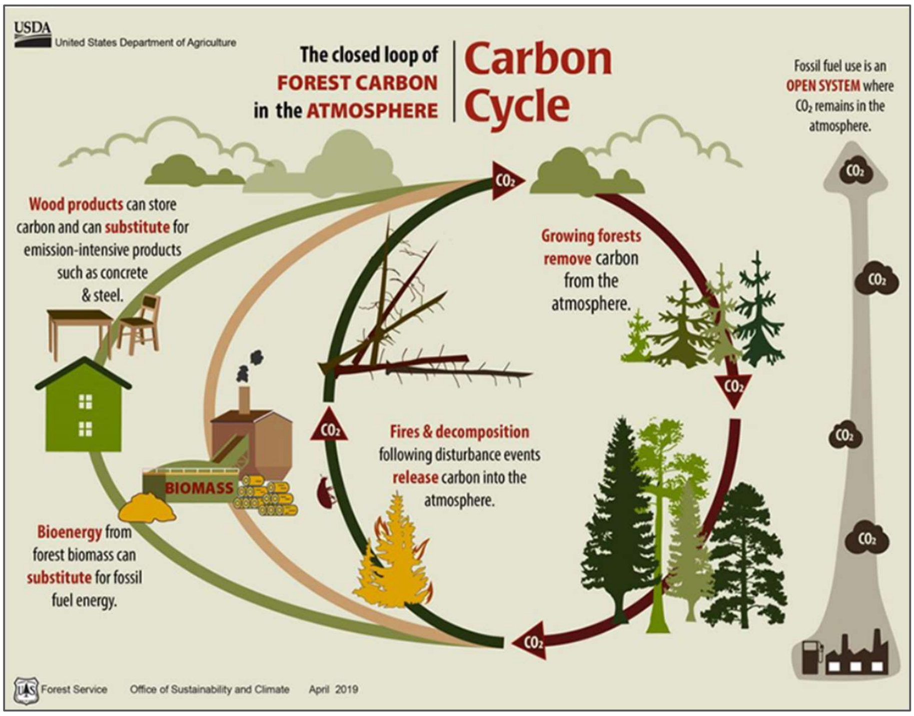
1.11 Description of the Project Activity

As an ARR grouped project, the Future Green Carbon Project aims at implementing reforestation activities for production purposes in Eastern part of Mato Grosso do Sul state, in the Central-West region of Brazil, where the areas are traditionally dedicated to pasture or crops.

Forests have a natural capacity to absorb carbon dioxide through the photosynthesis, converting it into biomass in their trunks, roots and leaves. This carbon can be transferred to the soil as organic matter by decomposing roots, leaves and wood. The uptake and retention of carbon within forests play a vital role in counteracting climate change and minimizing its effects on our environment and society[7].

Figure 2: Carbon Cycle

[7] USDA – United States Department of Agriculture. https://www.fs.usda.gov/managing-land/sc/carbon



Source: United States Department of Agriculture (USDA)

The implementation area of this initial instance totals 32,226.25 hectares in 50 properties owned or leased by Eldorado. This project activity instance is expected to remove an average of approximately 4,203,026.55 tCO_2e from the atmosphere over the 31-year period. Over time, the grouped project may reach a larger scale, going beyond 100,000 hectares, based on the additional incorporation of PAIs, to be defined on a case-by-case basis.

Forestry management: technologies/ measures employed

The project activity will be based on the implementation of hybrids of species of *Eucalyptus urophylla* and *Eucalyptus grandis*. Adaptation to environmental conditions of soil, climate, biodiversity, and productivity are some of the main aspects considered when defining the species to be planted in the project region. The main species used in the enterprise are *Eucalyptus urophylla* and hybrid *Eucalyptus urograndis* (*Eucalyptus urophylla* + *Eucalyptus grandis*).

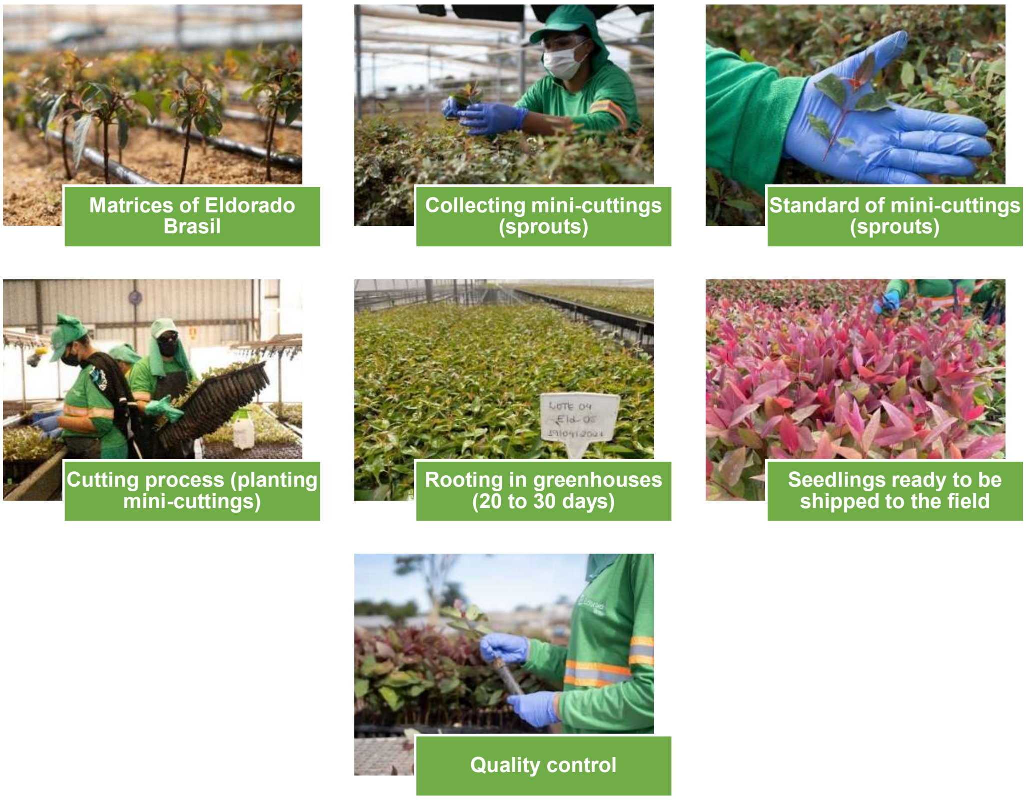
The forestry area is responsible both for the production of seedlings and for the stages, from the preparation of the area to the maintenance that precedes the harvest of the forests. These activities guarantee the formation of forest plantations according to the requirements of quality, productivity, and cost, with respect to the environment. At the end of the five- to seven-year cycle, after all the activities and monitoring provided for in the Forestry process have been carried out, the area is made available for the execution of the wood harvest.

Overall, the measures adopted are based on the following activities:

Seedlings production (Nursery): Nursery activities involve the mini clonal garden, the greenhouse, the shade house, the growth, acclimation, and the dispatch of seedlings. The production cycle necessary for the complete development of the seedlings lasts, on average ninety days, starting in the miniclonal garden, where the planting and maintenance of the matrices, collection and planting of the shoots (mini cuttings) are carried out. In all stages of the production process the fertilization and irrigation activities are carried out together (Fertirrigation), being controlled by automated systems that allow the sending of precise amounts of fertilizers and water for the best development of the plants. Before being planted on the farms, the seedlings go through a Quality Assessment process in which only the seedlings that meet the necessary standards, are sent for planting.

The production of seedlings also takes into account a wide range of studies developed by Eldorado which assess climate scenarios up to 2050. Theses research activities provide inputs for clonal activities developed in the nursery as well as for the implementation of specific forest management practices on field.

Figure 3: nursery production cycle



Source: Eldorado

Preparation of Planting Area: In the planning phase the areas for planting are selected, and they are already mostly anthropized by the existence of pastures, eventually with sparse native trees. This activity aims to prepare the land to receive the seedlings, ensuring the standardization of the planting activity. In this phase is made the control of the leafcutter ant and the construction and maintenance of roads and firebreaks, operations better detailed in the following items.

Soil Tillage: demarcation of the planting lines by means of subsoiling, which is a soil management strategy to minimize soil compaction based on the minimum cultivation technique so that the seedlings can be planted. Soil tillage can be performed by either subsoiling with or without fertilization, depending on soil conditions. Simultaneously with the soil preparation operation, the fight against leaf-cutting ants and the chemical control of competition bush are also carried out.

Soil Fertilization: carried out in accordance with technical recommendations and following the internal operational procedures. Soil fertilization is carried out in soil preparation, planting, reforming or conducting regrowth, as well as at the time of carrying out activities related to the maintenance of plantations, which occur at different times in forest rotation. The fertilizers used are limestone, boron, gypsum and NPK. Fertilizer applications may be performed both manually and mechanized, and fertilization is also possible via aerial application.

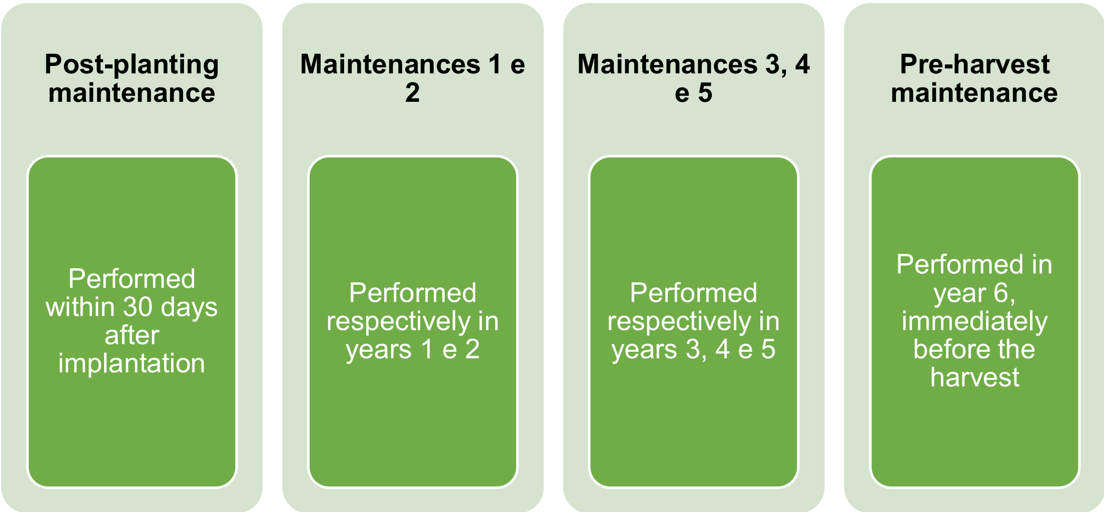
Planting and Resprouting: The establishment of the forest base occurs in athropized non-forested areas, mainly pasture. In this situation the planting activity is called "implementation". After implementation, resprouting techniques area applied as per the species rotation and at the end of the cycle (last harvest), “reform” techniques are conducted, i.e. new. A third modality refers to the activity of "regrowth conduction" when after harvesting, new seedlings are not planted as in the reform, but rather the sprouting conduction of the stump of the harvested trees is performed. After the distribution of the seedlings in the soil, depending on the humidity conditions and climatic conditions, irrigation of the planting can be carried out with or without the use of water solution with hydrogel. Along with planting is carried out the adduction with NPK + micros, to ensure a good "start" of the planted seedlings. When necessary, usually when survival was less than 95% or there are failures in grinding wheels, seedlings are replanted, counting on all the operations performed at the time of planting. State-of-the-art technologies are used in forestry operations and provide efficiency gain and prevent environmental impacts.

Figure 4: planting activities: A: Planting; B: Irrigation.

Source: Eldorado

Forest Maintenance: After planting or managing resprouting, the maintenance of the plantations is carried out from the post-planting phase to the sixth year, or pre-harvest season. The main activities are: combating ants, weed control, and health control.

Figure 5: maintenance activities standard schedule



Despite some variations resulting from specific needs, the operations performed in these maintenance are similar and described below.

Ant control: The control method will depend on the silvicultural phase (Pre-planting, Planting, Sprouting Conduction and Maintenance), and can be carried out in a localized or systematic way, following the recommendations provided for in operational procedures.

Weed control: aims to reduce competition between eucalyptus and other plants for water, light and nutrients. The competition bush control operations will be used for the control of broadleaf weeds, being more viable, economically, and environmentally the mechanical control. This control can be done chemically (as per applicable regulations and internal operational procedures) or mechanically (manually or mechanized and mix manually/ mechanized weeding). The control in the planting line will be carried out in the initial phase of plant development.

Figure 6: mechanical control of weed competition

Source: Eldorado

Health control of the forests: control of pests and diseases in the nursery and eucalyptus planting, aiming to reduce plant mortality and ensuring the productivity of the areas. If there is a need for control, the chemical, biological or mechanical methods can be used. Systematically, plantations will be monitored for the presence of pest attacks. In case of substantive attacks, control measures are carried out.

Figure 7: Pests and application of insecticides

Source: Eldorado

Harvest: harvesting will be carried out in a mechanized way, based on a cut-to-length harvesting system. All activities aim at managing the resources more efficiently, ensuring safety, reducing negative impacts, and increasing positive ones. Trees are cut inside the plot, leaving in the soil all the residual biomass of the operation (branches, leaves, tips and bark) that will help in its conservation and in the cycling of nutrients for the next productive cycles, then moved to the edge of the plot (an operation called “baldeio”), close to the road, where logs then are piled for future transportation.

> Equipment: Track harvester – used for felling, debarking, delimbing and bucking trees, leaving them ready for “baldeio”, which takes place approximately 10 days after cut; Forwarder – performs “baldeio” taking logs from inside the plot to the edge of it for future transportation.

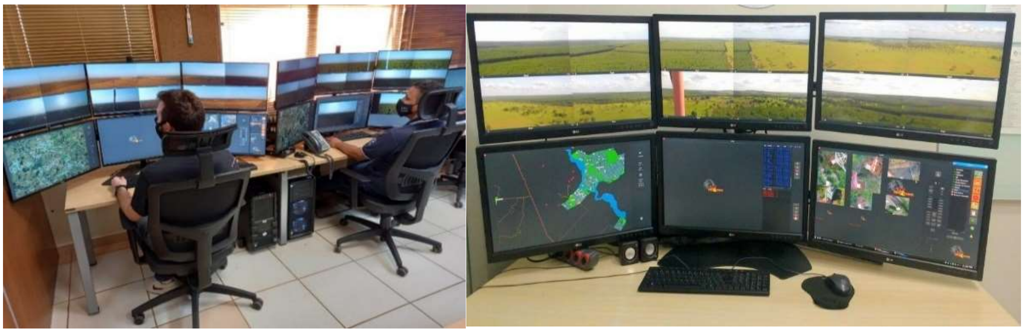
Figure 8: harvest equipment.

Source: Eldorado

Monitoring and Prevention of Forest Fires: The project will bring to all its areas the forest fire monitoring system, which has state-of-the-art cameras with HD image quality, which capture occurrences of fire outbreaks, as well as send real-time images of the status of the company's forest areas. In addition to these attributes, the system also brings in an integrated way meteorological stations, which send information about the weather conditions in real time in each of the regions observed in the forest monitoring.

Monitoring will be carried out daily in real time, 24 hours a day. The alerts of occurrences in the regions covered by the monitoring will be carried out by automatic detection of fire outbreaks with automated alarms and 360º visualization, allowing an accuracy in the activation of the firefighting brigades closest to the place of occurrence, thus reducing the time between the detection and the combat of the outbreaks.

Figure 9: Forest Fire Monitoring Center



Source: Eldorado

The observation towers will be on average 60 meters high and have the range of images abovethe radius of 15 km on days with good visibility and at least 7 km on days with poor visibility.

The proposed Future Green Carbon Project will make the tower park available and expand the monitoring coverage, even to neighboring areas to new plantations.

Figure 10: Example of observation towers to be made available for the project areas.

Source: Eldorado

In addition to the cameras, Brigadiers and Fire Brigades trained and qualified to carry out immediate combat the occurrences that may arise, will be available.

All occurrences are recorded in the forest management system and the appropriate measures are forwarded. In the case of legal infractions that may affect the management unit, the competent authorities are triggered.

All above mentioned equipment and techniques are subject to continuous improvement practices, whereby changes may occur to ensure the most up-to-date and cost-effective approach.

1.12 Project Location

The geographical area within which this grouped project will be implemented is defined as the borders of the state of Mato Grosso do Sul (MS), in the Central-West region of Brazil.

Table 3: Geographic information of the [grouped] project boundaries.

BRAZILIAN STATE	LATITUDE	LONGITUDE
Mato Grosso do Sul	20° 46' 20.028" S	54° 47' 06.551" W

Table 4: Geographic information of the project boundaries (see Figure 5 for the map with the location of each property).

ID CODE	PROPERTY NAME	LATITUDE	LONGITUDE
# Farm			
0009-003-18-0001-00	Campo Limpo I	7734621,6	424152,886
0322-003-18-0001-00	Recanto-Minervino	7793154,88	443404,959
0357-003-18-0001-00	São Mateus Rezek	7753305,73	419057,131
0423-003-18-0001-00	Santa Rita de Cássia	7789322,14	443717,87
0574-003-18-0001-00	Vale da Pecuária	7754163,03	446852,97
0575-003-18-0001-00	Cel. Cacildo Arantes	7732107,86	444991,45
0576-003-18-0001-00	Santa Olga II	7762713,54	388265,15
0577-003-18-0001-00	Santa Edwirges	7762843,04	450115,094
0578-003-18-0001-00	Caçula I e II	7756141,36	424210,668
0579-003-18-0001-00	Da Mata	7734036,03	446351,896
0581-003-18-0001-00	São Francisco-Francisco Queiroz	7823471,85	382720,743
0589-003-18-0001-00	Divisa-Onofre	7804599,14	458961,397
0592-003-18-0001-00	São Jorge-Jorge Elias	7823581,88	403355,169
0593-003-18-0001-00	Varjãozinho	7772129,37	398342,068
0594-003-18-0001-00	Aliança	7789877,17	450027,62
0595-003-18-0001-00	Nova Monte Alto	7721720,01	388608,875
0596-003-18-0001-00	Padroeira	7795018,71	432444,23
0597-003-18-0001-00	Paraiso do Queixada	7768865,15	422866,218
0598-003-18-0001-00	Marca Quatro	7772337,01	317079,35
0599-003-18-0001-00	Barra Dourada	7729030,73	429127,977
0600-003-18-0001-00	Signo Sol	7803738,42	455094,496
0601-003-18-0001-00	São Luiz-Antenor (Santa Rosa)	7792102,08	448138,461
0602-003-18-0001-00	São Benedito II	7730560,03	431437,51
0604-003-18-0001-00	Boa Vista-Aires	7796562,23	444214,207
0630-003-18-0001-00	Santa Irene-Alvarez	7789829,85	391248,592
0631-003-18-0001-00	Estiva I	7764893,57	456526,695
0632-003-18-0001-00	Idalina	7779609,61	433034,635
0633-003-18-0001-00	Nossa Senhora Fatima-Alvarez	7786238,63	428035,536
0634-003-18-0001-00	Vanemar	7787498,57	433146,81
0635-003-18-0001-00	1º Maio	7785508,97	430587,97
0636-003-18-0001-00	1º Julho	7784930,51	434159,889
0637-003-18-0001-00	Santa Luzia-Coletti	7800263,34	462691,773
0638-003-18-0001-00	São Vitor	7774031,6	385673,613
0639-003-18-0001-00	Nossa Senhora Fatima-Claudio Franco	7777886,51	389973,914

ID CODE # Farm	PROPERTY NAME	LATITUDE	LONGITUDE
0640-003-18-0001-00	Jacuba	7784348,08	386814,019
0641-003-18-0001-00	Vó Neuza	7775491,13	387522,735
0642-003-18-0001-00	Nossa Senhora da Penha	7742389,18	435515,359
0643-003-18-0001-00	São José Gleba II	7745291,92	454947,49
0644-003-18-0001-00	Alba	7725697,68	436270,506
0645-003-18-0001-00	Santa Vera	7720692,45	434464,048
0646-003-18-0001-00	São Martinho	7726196,88	434729,203
0647-003-18-0001-00	Rio Preto	7765165,9	467493,646
0648-003-18-0001-00	Conquista II	7761599,93	443053,39
0649-003-18-0001-00	Rancho Pecora	7748414,65	423214,273
0651-003-18-0001-00	Conquista-Coletti	7806821,73	452376,016
0653-003-18-0001-00	Três Irmãos	7803435,1	451287,125
0654-003-18-0001-00	São José	7781953,09	413082,236
0657-003-18-0001-00	Santa Therezinha	7795546,77	474526,127
0659-003-18-0001-00	Raimundo Bezerra	7741475,57	436522,389
0662-003-18-0001-00	Beija-Flor	7723930,37	420173,387

1.13 Conditions Prior to Project Initiation

The state of Mato Grosso do Sul[8], has a population of 2,449,024 inhabitants, being 6.86 inhabitants/km². Its territory, of 357,147 km², has 79 municipalities, and is inserted in the Cerrado (62%) and Atlantic Forest (10%) and Pantanal (28%) biomes. Campo Grande is the capital city.

Soil and Topography: The main type of soils found in the region are the Latosols and Neosols and small patches of Argisols. The Red Latosols are dominant in the region, being also the most representative soil type in the state.

Table 5: types of soil in the first instance area

Types of soil	%
Argisol Red-Yellow Dystrophic	7.42%
Argisol Red Dystrophic	22.04%
Latosol Red Dystrophic	54.72%
Ortic Quartzarenic Neosol	14.52%

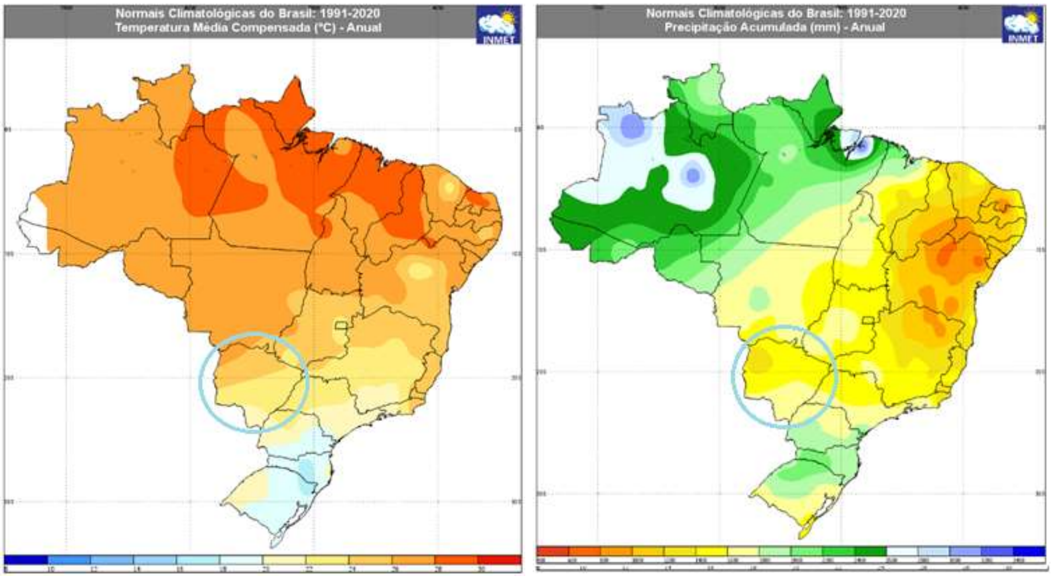
[8] See https://cidades.ibge.gov.br/brasil/ms/panorama

Dystrophic Haplic Planosol	1.29%
Total	**100%**

The predominant relief is the plateau, and there are also the river plains; the altitude is low and most farms are between the 250m and 500m dimensions, with few regions included in higher levels of relief, i.e. above 500 m altitude.

Climate: The climate in the region of the first instances is tropical, hot and humid, with the rainy season in summer and dry season in winter. Average annual precipitation is of 1,380 mm and average temperatures of 24.7 °C, according to the climatological standards of the National Institute of Meteorology (INMET).

Figure 11: average annual temperature (°C) and precipitation (mm) in Mato Grosso do Sul, 1991-2020.



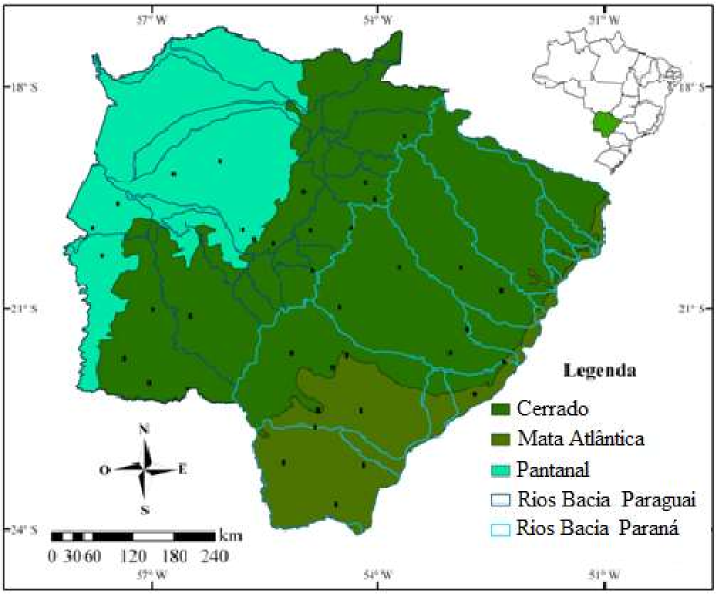
Source: INMET, 2022[9]

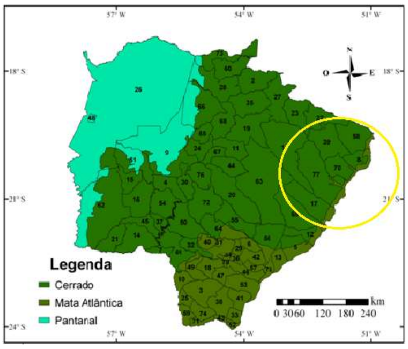
Hydrography: The areas of the first instances are located in the Paraná River basin (see Figure 3 below), located mainly in the sub-basins of the Pardo river, Verde river, Sucuriú river, the Quitéria river and the Santana river.

[9] See https://clima.inmet.gov.br/NormaisClimatologicas/1961-1990/precipitacao_acumulada_mensal_anual .

Ecosystems: The areas of the first instances are part of the second major Brazilian biome, the "Cerrado", which spreads through various geological, climatic, pedological and relief conditions, and is considered a biodiversity hotspot.

Figure 12: territorial division of biomes in Mato Grosso do Sul and river basins (small map: location of the first instance).





Source: Marcuzzo, 2012[10]

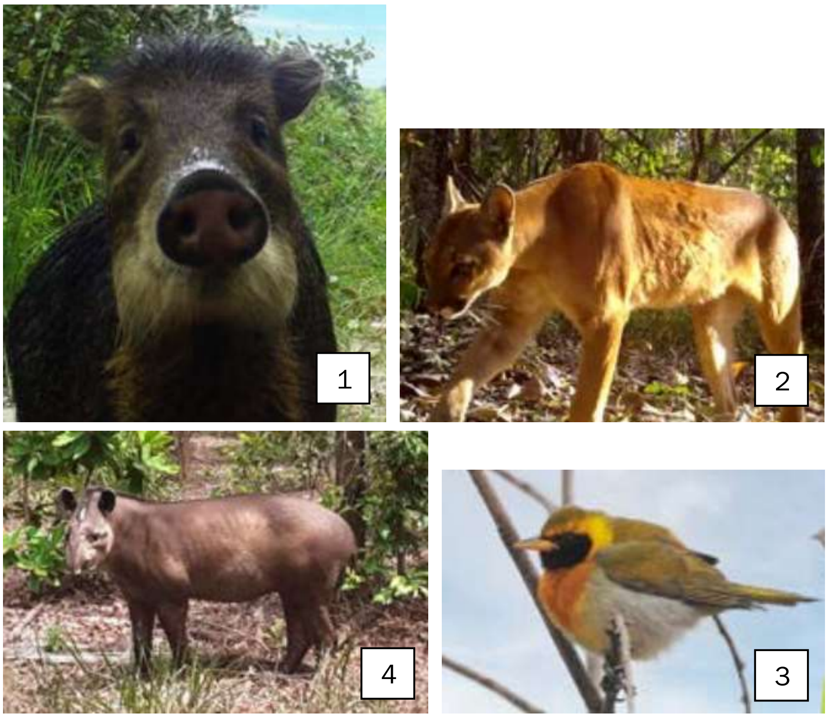
Within the prosed project activity, the farms will encompass two major types of forests, managed on an integrated basis: (i) planted forests for wood production purposes, and (ii) forests, mostly based on native species, with the purpose of recovery or conservation, further contributing to the enhancement of carbon stocks (although not claimed as VCUs) and biodiversity, including flora and fauna aspects, such as the protection of endangered or endemic species.

- The diversity of fauna found in the project area is expected to be higher than in previous studies conducted in Mato Grosso do Sul. Rare species such as the "cachorro-vinagre" (*Speothos venaticus*), the "paca" (*Cuniculus paca*), the "tatu-canastra" (*Priodontes maximus*), are expected to be registered. As for individuals such as observations have also identified their offspring, showing that. The occurrence of an environmental balance is also likely to lead to the presence of individuals such as the "anta" (*Tapirus terrestris*) and the "onça-parda" (*Puma concolor*), also enabling their reproduction. Other important species for seed dispersal as the "anta" (*Tapirus terrestris*), the "cateto" (*Dicotyles tajacu*), the "queixada" (*Tayassu pecari*), The "cachorro-do-mato" (*Cerdocyon thous*), the

[10] See https://rigeo.cprm.gov.br/jspui/bitstream/doc/614/1/Art_Estudo_Marcuzzo.pdf.

"lobo-guará" (*Chrysocyon brachyurus*), and the "cutia" (*Dasyprocta azarae*), are also expected to be recorded. The Figure below illustrates some of the species potentially found and protected within the project.

Figure 13: 1) the "queixada" (*Tayassu pecari*), 2) the "onça-parda" (*Puma concolor*), 3) the "saíra-de-papo-preto" (*Hemithraupis guira*), and 4) the "anta" (*Tapirus terrestris*).



Source: Eldorado's Management Plan, 2021

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The most relevant regulations to which the project is subjected to are:

LAWS AND REGULATIONS	WHAT	HOW
Federal Law N. 12651, 25/05/2012	This law establishes the new Brazilian Forestry Code; also creates the Rural Environmental Registry (CAR).	Eldorado has robust procedures in place guiding operations and the environmental management system. It complies with licensing requirements and its conditions, in addition to maintaining a legal system by area & responsible person, which is frequently audited.

LAWS AND REGULATIONS	WHAT	HOW
State Decree N.13977, 05/06/2014	Addresses the Rural Environmental Registry within Mato Grosso do Sul state.	To comply with the Rural Environmental Registry (or CAR), all rural properties must have an updated registration. This is a legal obligation which our contracts are linked to in order to ensure registration and maintenance from partners. In addition, the company's Forest Management System - SGF, keeps the registration of all rural properties, as well as their periodic updating, guaranteeing legal compliance and integrity of the environmental conservation areas.
State Resolution SEMADE N.09, 13/05/2015	Establishes standards and procedures for Mato Grosso do Sul state environmental licensing.	Eldorado's robust procedures that are part of the company's routine, which guarantee that all activities are in line with the current applicable environmental legislation. All activities are mapped and are part of multidisciplinary committees to guarantee full compliance.
State Law N.4163, 02/01/2012	Disciplines the use of forests within the state of Mato Grosso do Sul, and use of forest raw material.	Eldorado's management is designed for planted forests only.
Federal Law N.9433, 08/01/1997	Addresses the right of use of water resources and ensures control of water use, both quantitatively and qualitatively.	The company is granted the right of use of water resources from Federal rivers, keeping constant monitoring as for consumption and legal issues.
State Decree N.13990, 02/07/2014	It regulates the Right to Use Water Resources, under the control of the State of Mato Grosso do Sul.	The company is granted the right of use of water resources from State rivers, having the points of use registered, and keeps constant monitoring as for consumption and legal issues.
Federal Law N.7802, 11/07/1989	Addresses the use and inspection of pesticides, its components, and similar items.	Eldorado has a System and procedures in place to comply with Federal legislation guaranteeing traceability of use and destination of agrochemicals and their packaging.
State Law N.2951, 17/12/2004	Addresses the use and inspection of pesticides, its	Eldorado has a System and procedures in place to comply

LAWS AND REGULATIONS	WHAT	HOW
	components, and similar items in the state of Mato Grosso do Sul.	with State legislation guaranteeing traceability of use and destination of agrochemicals and their packaging.

1.15 Participation under Other GHG Programs

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

N/A. This grouped project was never registered or is seeking registration under any other GHG Programs.

1.15.2 Projects Rejected by Other GHG Programs

N/A. This grouped project was never rejected by any other GHG Programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

N/A. This grouped project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

N/A. This grouped project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

Supply Chain (Scope 3) Emissions

N/A. This project description is not being completed for the purpose of listing on the pipeline as under development. This is the under validation version.

1.17 Sustainable Development Contributions

The proposed project is part of an innovative planting system, through which more than 90% of the reforestation activities are developed on lands of local partners. Such an approach incentivizes the conversion of lands previously covered with pastureland or other agricultural practices into forestry areas, overcoming long-term traditional land use.

This approach enables the compliance of landowner partners with current environmental legislation, by promoting the restoration and conservation of forests under protection areas, which otherwise would be unlikely. In addition, it establishes a long-term relationship with the partners and stimulates their economic development, keeping their lands productive, and enabling the sharing of benefits. Within the project, Eldorado will also be responsible for providing technology, infrastructure and resources for planting and harvesting the forests developed through the partnership model.

All project lands will undergo independent forest certification, most likely FSC (Forest Stewardship Council), CERFLOR (Brazilian Forest Certification Programme) or eventually PEFC (Programme for the Endorsement of Forest Certification), further strengthening the commitment to global standards of action concerning social, environmental, and economic guidelines. As per Eldorado's macro sustainability strategy linked to the United Nation's Sustainable Development Goals – SDGs, the project will contribute directly and indirectly to several of the adopted goals. In addition to the direct benefit regarding climate change mitigation, other sustainable development benefits are presented in Table 6 below.

Table 6: the SDGs contributions

SUBJECT	SCOPE OF ELDORADO'S ACTIONS	SDG
Certifications and good practices	- Voluntary forest certifications and incentive to sustainable land use practices.	12 - Responsible consumption and production *Ensure sustainable consumption and production patterns.* 15 - Life on land *Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.*
Environmental efficiency management	- Efficiency in material consumption; - management of water resources and energy consumption in offices, factory, forest management; - effluent management; and - waste management, reuse and recycling of materials, including electronic waste.	2 - Zero hunger and sustainable agriculture *End hunger, achieve food security and improved nutrition and promote sustainable agriculture.* 9 - Industry, innovation and infrastructure *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.* 11 - Sustainable cities and communities

		Make cities and human settlements inclusive, safe, resilient and sustainable. 13 – Climate action *Take urgent action to combat climate change and its impacts.*
Biodiversity	- Environmental education actions for surrounding communities, training of employees, monitoring of fauna and flora, management of information related to Eldorado's areas of high conservation value, and action and response of the Fire Brigade.	2 - Zero hunger and sustainable agriculture 15 - Life on land
Technology innovation	- Investments in technologies for more efficient and sustainable production; - awards in innovation programs; - performance of the Forest Intelligence Center of Eldorado Brazil; and - number of initiatives implemented by the "Inovar" Program.	2 - Zero hunger and sustainable agriculture 8 - Decent work and economic growth *Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.* 9 - Industry, innovation and infrastructure 12 - Responsible consumption and production
Human and organizational development Diversity and equal opportunity	- Program for the integration of new employees, retention of talents; - performance analysis, leadership development. - Discrimination and corrective measures; - gender pay gap; - diversity in Eldorado's staff.	5 - Gender equality *Achieve gender equality and empower all women and girls.* 8 - Decent work and economic growth
Development of local communities	- Management of positive and negative impacts (social, environmental and economic) in the surrounding communities; - development of environmental education activities and social actions in	11 - Sustainable cities and communities 12 - Responsible consumption and production 17 - Partnerships for the goals

	the municipalities of Eldorado's influence; - company's involvement with social projects of partner organizations; and - corporate volunteering actions.	*Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.*
Transparency, ethics, and the fight against corruption	- Communication and specific training in anti-corruption policies; - care for the reputation and credibility of Eldorado; - prevention of misconduct in management; - identification of confirmed cases of corruption; and - corrective and/or disciplinary measures.	**16 - Peace, Justice and strong institutions** *Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels.*

1.18 Additional Information Relevant to the Project

Leakage Management

This section will be completed for validation.

Commercially Sensitive Information

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

Further Information

This section will be completed for validation.

2 SAFEGUARDS

2.1 No Net Harm

The Future Green Carbon Project exclusively targets non-forested and anthropized areas, especially those previously dedicated to grazing and crops that were deforested years prior. Hence, reforestation of these areas promotes substantial increase in carbon sequestration, improving soil fertility through nutrient cycling (e.g. leaves and branches left on site), as well as the reduction of soil erosion, help protect the remaining natural areas and biodiversity (EMBRAPA, 2017). The eucalyptus reforestation activities rigorously comply with environmental legislation and apply the criteria and principles of independent certifiers to their activities, consequently promoting the correct delimitation and regeneration of native vegetation in legal reserve and permanent preservation areas.

Potential impacts may derive mainly from land preparation activities and the harvest phase, e.g. noise, dust, conservation of local roads. To prevent any of these impacts, the PP strictly applies and follows the laws and regulations covering the silvicultural activities (see section 1.14) and seek forest certification for all its areas, which can attest the company's compliance with the management of issues such as identification and monitoring of possible negative and positive impacts, measures taken to mitigate or enhance these impacts, treatment of complaints and community concerns, social projects implemented and social monitoring carried out in the company's areas. Also, the PP has established procedures[11] to ensure broad communication channels with local stakeholders, so that any eventual impact arising from its forestry activities can be appropriately reported and are duly addressed, mitigated, and prevented. Furthermore, external audits are periodically conducted by FSC or CERFLOR in the PP's areas and are able to map any eventual impact arising from the forestry activities.

It is the PP's practice to characterize the communities in the vicinity of its areas of activity: considering a radius of 3 km[12], communities are identified and included in the company's database for relationship and socio-environmental engagement.

Likewise, the PP has adequate procedures to ensure that a new area included in its forest base complies with the requirements defined by the Forest Stewardship Council (FSC®) Certification Standard for forest plantations related to Principle 9 – High Conservation Values, in order to evaluate attributes of High Conservation Value for the appropriate measures related to protection plans, conservation and monitoring.

2.2 Local Stakeholder Consultation

As mentioned in item 2.1, the PP has a database for neighboring communities in place, observing a radius of 3 km from its activity areas. The stakeholders to be consulted were defined according to this company's database, municipality where the farms are located and radius maps for the farms, and divided into two groups: local representatives & institutions and community.

[11] These operational procedures will be presented to the VVB during validation audit.

[12] Following FSC standard.

Local representatives & Institutions

The consultation was sent via e-mail and customized form from Google Forms to stakeholders such as the municipal Environment Secretariats of the municipalities where the project will take place and to the State Environment Institute of Mato Grosso do Sul - IMASUL. The consultation form was opened for comments from 10 January 2023 to 10 February 2023. In all, eight (08) representative entities from the municipalities involved were invited (see Figure 18).

Figure 14: introductory email to the stakeholders' consultation.

Prezado, bom dia!

A Eldorado Brasil Celulose S.A., vem através deste e-mail convidá-lo a participar da consulta pública referente ao "Future Green Carbon Project", abaixo segue link do Google Forms, onde você poderá obter mais informações e realizar seus comentários.

Consulta Pública: https://forms.gle/6zVrrK6LKwKgUWrn9

Desde já muito obrigado, qualquer dúvida ficamos à disposição através do e-mail também.

Att,

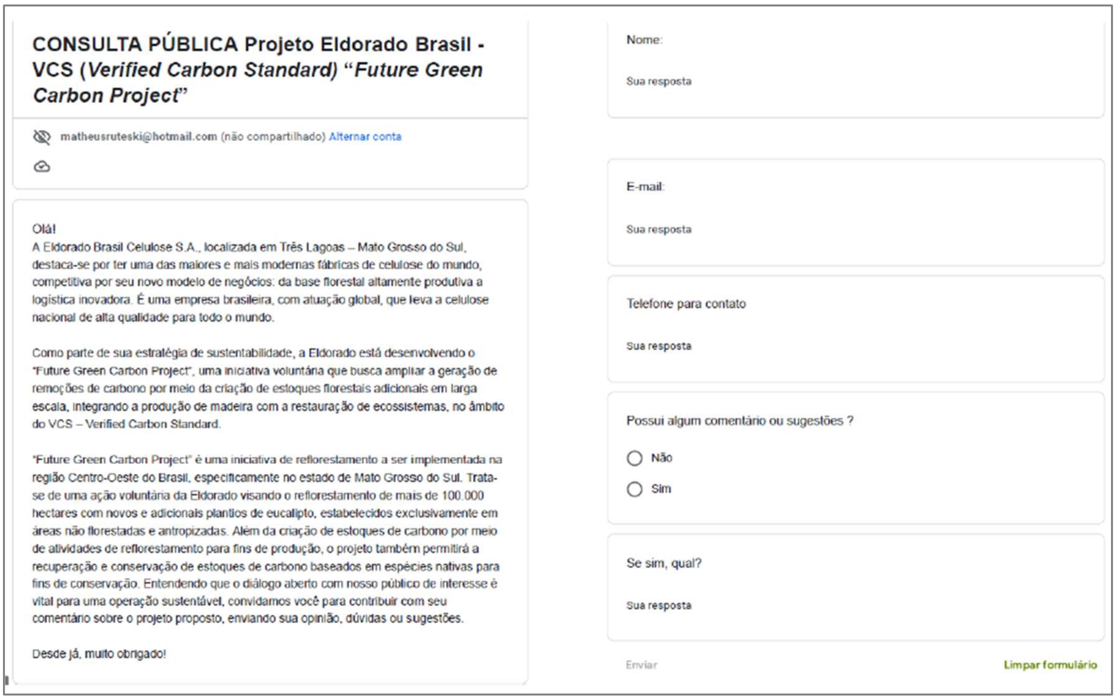
Eldorado Brasil

Sustentabilidade
Eldorado Celulose S/A
Sustentabilidade
sustentabilidade@eldoradobrasil.com.br

Rod. BR 158 - Km 231
Faz. Santa Vera - Zona Rural
67 3509-0161
Três Lagoas – MS – CEP: 79641-300
www.eldoradobrasil.com.br

Source: Eldorado

Figure 15: customized form by Google Forms.



CONSULTA PÚBLICA Projeto Eldorado Brasil - VCS (*Verified Carbon Standard*) "*Future Green Carbon Project*"

matheusruteski@hotmail.com (não compartilhado) Alternar conta

Olá!
A Eldorado Brasil Celulose S.A., localizada em Três Lagoas – Mato Grosso do Sul, destaca-se por ter uma das maiores e mais modernas fábricas de celulose do mundo, competitiva por seu novo modelo de negócios: da base florestal altamente produtiva a logística inovadora. É uma empresa brasileira, com atuação global, que leva a celulose nacional de alta qualidade para todo o mundo.

Como parte de sua estratégia de sustentabilidade, a Eldorado está desenvolvendo o "Future Green Carbon Project", uma iniciativa voluntária que busca ampliar a geração de remoções de carbono por meio da criação de estoques florestais adicionais em larga escala, integrando a produção de madeira com a restauração de ecossistemas, no âmbito do VCS – Verified Carbon Standard.

"Future Green Carbon Project" é uma iniciativa de reflorestamento a ser implementada na região Centro-Oeste do Brasil, especificamente no estado de Mato Grosso do Sul. Trata-se de uma ação voluntária da Eldorado visando o reflorestamento de mais de 100.000 hectares com novos e adicionais plantios de eucalipto, estabelecidos exclusivamente em áreas não florestadas e antropizadas. Além da criação de estoques de carbono por meio de atividades de reflorestamento para fins de produção, o projeto também permitirá a recuperação e conservação de estoques de carbono baseados em espécies nativas para fins de conservação. Entendendo que o diálogo aberto com nosso público de interesse é vital para uma operação sustentável, convidamos você para contribuir com seu comentário sobre o projeto proposto, enviando sua opinião, dúvidas ou sugestões.

Desde já, muito obrigado!

Nome:
Sua resposta

E-mail:
Sua resposta

Telefone para contato
Sua resposta

Possui algum comentário ou sugestões ?
Não
Sim

Se sim, qual?
Sua resposta

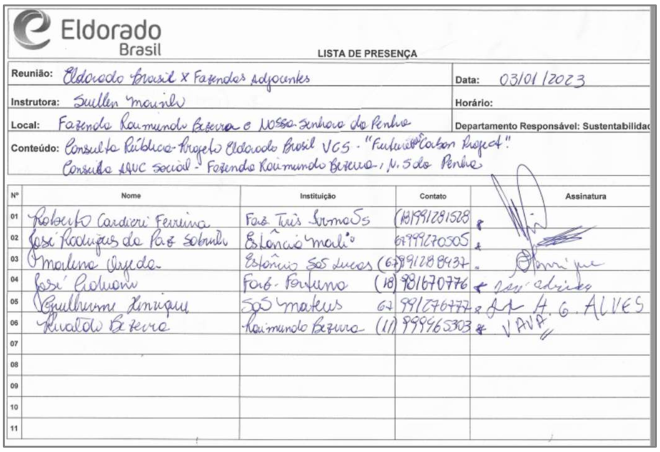
Enviar
Limpar formulário

Source: Eldorado

Community

The consultation took place in person between 3 January and 2 February 2023, where the PP's team visited the stakeholders and explained about the project, taking note of information, handing the consultation form and contact information for any suggestions and complaints. In all, 119 people were interviewed. The consultation via form was opened for comments for another thirty 30 days after the last interview, i.e. 2 March 2023.

Figure 16: photos of the local stakeholder visits to the community and one of the participation lists.


Eldorado Brasil

LISTA DE PRESENÇA

Reunião: Eldorado Brasil x Fazendas adjacentes — Data: 03/01/2023

Instrutora: Suellen Maurilo — Horário:

Local: Fazenda Raimundo Bezerra e Nossa Senhora da Penha — Departamento Responsável: Sustentabilidad

Conteúdo: Consulta Pública - Projeto Eldorado Brasil VCS - "Future Carbon Project". Consulta AAVC social - Fazenda Raimundo Bezerra, N. S da Penha

Nº	Nome	Instituição	Contato	Assinatura
01	Roberto Cardieri Ferreira	Faz Três Irmãos	(18)991281528	[illegible]
02	José Rodrigues de Paz Sobrinho	Estância Mali	67999270505	[illegible]
03	Marlene Ojeda	Estância São Lucas	(67)991288437	[illegible]
04	José Cichoni	Faz. Fortuna	(18) 981670776	[illegible]
05	Guilherme Henrique	São Mateus	67 991276777	A. G. ALVES
06	Rinaldo Bezerra	Raimundo Bezerra	(11) 999965303	[illegible]
07				
08				
09				
10				
11				

Source: Eldorado

The process for stakeholder consultation was documented in an internal report that will be presented to the VVB during validation. Even though all parties consulted received the consultation form, no comments were received during the consultation period. The list of forwarded emails can be found in the PP's database.

Up to the date of conclusion of this PD version, there were no comments and inquiries received during the local stakeholder consultation, nor any grievances.

On-going communication with local stakeholders will occur via the PP's official channels, e.g. the website and social media platforms, such as Instagram, and email.

In addition to the information and clarifications during the visits and email consultation, the PP will make the Verra's project page public to stakeholders when the page is created. This will provide effective and timely communication of:

- the project design and implementation, including the results of monitoring;
- the risks, costs and benefits the project may bring to local stakeholders;
- the relevant laws and regulations covering workers' rights in the host country; and the process of VCS Program validation and verification and the VVB's site visit.

2.3 Environmental Impact

State law in Mato Grosso do Sul does not require an Environmental Impact Study – EIA for reforestation, since this is considered an activity of low environmental impact, as per SEMADE-MS (Mato Grosso do Sul State Secretariat for the Environment and Economic Development) Resolution n. 9/2015[13]. In addition, as mentioned in section 1.17 above, it is the PP's goal to have 100% of its areas certified by independent certification systems, such as FSC and CERFLOR, and these requires even more rigorous socio-environmental management criteria than the legislation.

The PP's biodiversity management includes the assessment of richer and more important natural areas for the conservation, monitoring, and analysis of ecosystems in the areas where operations are located. This allows for the identification of possible impacts of the process in order to prevent and/or mitigate them and protect the areas. Actions to combat forest fires are also planned as a way to reduce damage in the PP's areas, as well as in neighboring areas.

The PP cares for a better management of water resources, aiming at a more conscious use of water, where preventive, mitigatory and corrective measures are special attention is given to the use of water within the nursery.

Potential impacts may derive mainly from land preparation activities and the harvest phase. These were addressed in section 2.1 above.

2.4 Public Comments

[13] See https://www.imasul.ms.gov.br/wp-content/uploads/2019/11/Res-Semade-09-2015-compilada.pdf.

Up to the conclusion date of this PD version 1, no comments were received.

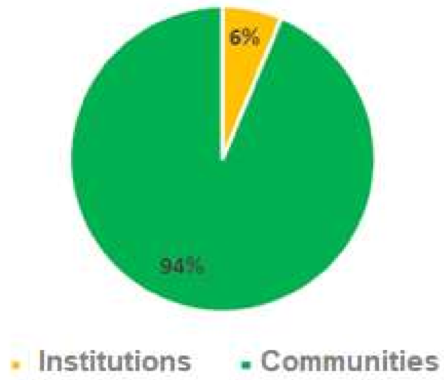
2.5 AFOLU-Specific Safeguards

The representative institutions consulted during the local stakeholder's consultation were chosen based on the five municipalities in which the project areas are located, that is, Aparecida do Taboado, Inocência, Paranaíba, Selvíria and Três Lagoas (see Figure 9 below).

The territorial scope of this work covers the population concentration such as villages, settlements, urban centers, districts, neighborhoods, and the like, that may be affected by the activities of the project and that are located up to approximately three kilometers from the limits of the farms, according to the methods defined by the PP.

In all, the consultation reached one hundred and twenty-seven (127) people among neighbors and public agencies distributed as 94% and 6%, respectively. As already mentioned in the previous sections, there were no comments received up to the conclusion of this PD.

Figure 17: distribution of stakeholders consulted per category.



Source: Eldorado

This grouped project poses no risk to the integrity of stakeholders, stakeholders' resources nor to their property rights. All properties are under duly signed legal agreements as per section 1.7.

The PP's contact information such as phone, e-mail and addresses were disclosed to all in case any stakeholder wishes to manifest up to thirty days after the interview. Furthermore, as per item 2.2 above, ongoing communication is guaranteed with all stakeholders through the PP's communication channels.

The PP has internal procedures aimed at complying with labor regulations. The local workforce and economic activities are valued and stimulated, promoting a virtuous social and economic circle in the surroundings of the project areas. The PP offers sustainable opportunities for growth by giving preference to regional professionals and suppliers.

The company has in place its program for Socio-Environmental Relationship (*RES – Relacionamento e Engajamento Socioambiental*) program, through which it maintains communication with communities, residents, and neighbors to the company's (see more in section 2.1 above).

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The methodology applied by this first instance is: *AR-ACM0003 – Afforestation and reforestation of lands except wetlands, Version 02.0*.[14]

Methodological tools applied by this methodology[15]:

- Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities, Version 01.
- Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity, Version 04.0.0.
- Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities, Version 03.1.
- Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/RCDM project activities, Version 04.2.
- Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity, Version 2.0.
- Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities, Version 01.1.0.

3.2 Applicability of Methodology

This methodology is applicable because the grouped project meets the following applicability conditions.

Table 7: methodology and applicable tools applicability conditions

Applicability conditions	Project compliance
AR-ACM003 methodology, version 02.0	

[14] See https://cdm.unfccc.int/methodologies/ARmethodologies/approved

[15] See https://cdm.unfccc.int/Reference/tools/index.html

Applicability conditions	Project compliance
The area of the project activity does not fall into the category of wetlands.	The project participant will verify the type of terrain on which the proposed project instances will be deployed using, for example, the Soil Map of Brazil – IBGE[16], in order to ensure that they are not established in wet areas, e.g. through information on the geographical location of the area and type of soil. Therefore, project activities will not fall into the category of wetlands.
Soil disturbances attributed to activities in the proposed project do not cover more than 10% of the project area that: i) Contain organic soils: PP will verify the type of land on which the proposed PAIs will be deployed using, for example, the Soil Map of Brazil - IBGE, in order to ensure that they are not established in organic soils, e.g. by information of the geographical location of the area and type of soil. Therefore, project activities will not fall into the organic soil category. ii) At the baseline are subject to land use management conditions which receive inputs listed in Appendices 1 and 2 of the AR-ACM0003 methodology, version 02.0: If the land use at baseline falls within one of the conditions listed in Appendices 1 and 2 of the AR-ACM0003 methodology, PP will verify that tillage do not disturb more than 10% of the project area, e.g. evaluation of the proportion of tilled area (width x length of the tillage line x number of tilled lines or dug area x number of pits) in relation to the total area of the project.	In general, PP will adopt minimal cultivation, i.e. revolving soil only on the planting line, resulting in a very low impacts.
“Combined tool to identify the baseline scenario and demonstrate the additionality of the CDM A/R project activities”, version 01	
Reforestation in the area within the proposed boundaries, conducted with or without registration as AFOLU VCS activity, should not lead to the violation of any applicable laws, even if these laws are not being enforced.	Reforestation in the area within the proposed limits do not violate any local or national laws.
This tool is not applicable to small-scale AFOLU project activities.	All PAIs under this Grouped project are expected to I be large-scale,
Tool *“Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity, version 04.0.0. ”*	

[16] See ftp://geoftp.ibge.gov.br/informacoes_ambientais/pedologia/mapas/brasil/solos.pdf

Applicability conditions	Project compliance
The tool is applicable to all occurrence of fire within the project boundary.	This PD takes into consideration the emissions occurring due to accidental fires.
Non-CO_2 GHG emissions resulting from any occurrence of fire within the project boundary shall be accounted for each incidence of fire which affects an area greater than the minimum threshold area reported by the host Party for the purpose of defining forest, provided that the accumulated area affected by such fires in a given year is ≥5% of the project area.	This applicability condition will be assessed during the monitoring of each PAI. PP will verify if the area affected by fire in a given year exceeds the limit of 5% of the project area. If the burnt area exceeds 5% of the project area, the area affected will be delimited according to parameter $A_{BURN,i,t}$ and the calculation of non-CO2 GHG emissions will be done according to item 4.4.1(b).
Tool "*Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities, version 03.1*"	
N/A. This tool has no internal applicability conditions.	N/A.
Tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/RCDM project activities, version 04.2"	
N/A. This tool has no internal applicability conditions.	N/A.
Tool "*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity, version 2.0* "	
This tool is not applicable if the displacement of agricultural activities is expected to cause, directly or indirectly, any drainage of wetlands or peat lands.	As mentioned above (a), no PAI under this grouped project will be implemented in areas containing wetlands, nor peatlands.
"Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities, version 01.1.0"	
N/A. Conservatively, there will be no claiming of credits for this pool under this grouped project.	N/A.

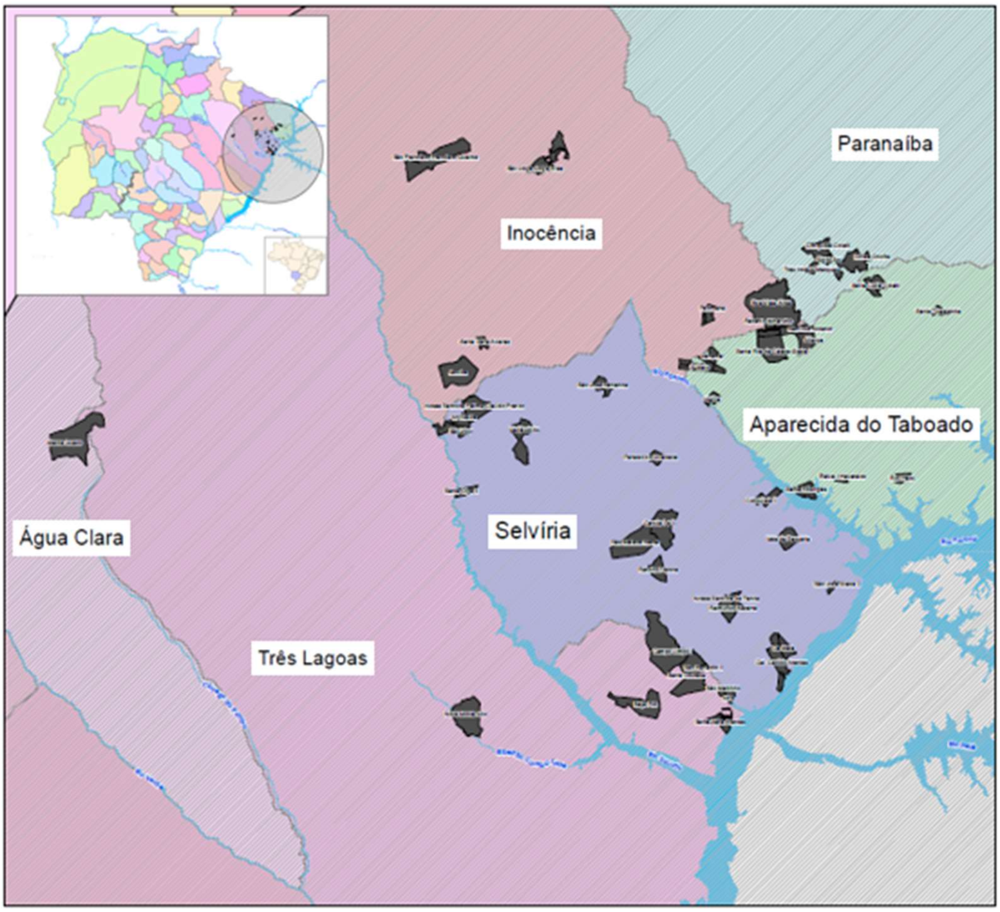
3.3 Project Boundary

In compliance with the methodology applied, the spatial boundaries of the project are totally identified by GPS coordinates, satellite images and shape files. All information on the area and limits of project plantations are recorded in Eldorado's forestry system.

For management and organizational purposes, the project entity operates different plantation sites, respectively located at each of the municipalities informed in Table 2 in Section 1.7. These sites are included in the current project boundaries and represent the first instance of this grouped project. Each area is divided into plantation stands, which are the actual plantation sites, all uniquely identified according to internal identification codes. Thus, the sum of every plantation stand included in this grouped project will be the actual project boundary. All pertinent information is available and will be presented to the VVB.

The project activity is located in the Eastern part of the state, on average 400 km from Campo Grande, the capital of Mato Grosso do Sul.

Figure 18: The “Future Green Carbon Project” first instance’s areas in Eastern Mato Grosso do Sul, municipalities Paranaíba, Inocência, Aparecida do Taboado, Selvíria, Água Clara and Três Lagoas.



Source: Eldorado

The project boundaries contour the limits of the plantation areas established under this project. For baseline determination purposes it is assumed that these are the areas that would not be reforested in the absence of the proposed project.

Source		Gas	Included?	Justification/Explanation
Baseline	Above-ground biomass	CO_2	Yes	This is the largest carbon sink considered by the project
		CH_4	No	
		N_2O	No	

Source		Gas	Included?	Justification/Explanation
		Other	No	
	Below-ground biomass	CO_2	Yes	The carbon stock in this sink is expected to increase due to the implementation of the project
		CH_4	No	
		N_2O	No	
		Other	No	
	Dead wood Litter Soil organic carbon	CO_2	No	Conservatively, there will be no carbon accounting in these pools.
		CH_4	No	
		N_2O	No	
		Other	No	
Project	Above-ground biomass	CO_2	Yes	This is the largest carbon sink considered by the project
		CH_4	No	
		N_2O	No	
		Other	No	
	Below-ground biomass	CO_2	Yes	The carbon stock in this sink is expected to increase due to the implementation of the project
		CH_4	No	
		N_2O	No	
		Other	No	
	Dead wood Litter Soil organic carbon	CO_2	No	Conservatively, there will be no carbon accounting in these pools. However, it is expected that there will be an increase in carbon in these pools throughout the project.
		CH_4	No	
		N2O	No	
		Other	No	
Leakage	Above-ground biomass Below-ground biomass	CO_2	Yes	If leakage is applicable, these pools would represent the largest source of leakage emissions.
		CH_4	No	
		N_2O	No	
		Other	No	
	Dead wood Litter Soil organic carbon	CO_2	No	Carbon in these pools will not be accounted.
		CH_4	No	
		N_2O	No	
		Other	No	

Source		Gas	Included?	Justification/Explanation
Baseline	Burning of woody biomass	CO_2	No	CO_2 emissions due to the burning of biomass will be accounted for as a change in the carbon stock
		CH_4	Yes	Emissions from accidental fires will be monitored.
		N_2O	Yes	Emissions from accidental fires will be monitored.
Project	Burning of woody biomass	CO_2	No	Not applicable
		CH_4	Yes	Emissions from accidental fires will be monitored.
		N_2O	Yes	Emissions from accidental fires will be monitored.

3.4 Baseline Scenario

The identification of the baseline scenario for the areas at the limits of the project activity instances will follow the provisions of the methodology AR-ACM0003 version 02.0 in its item “Identification of the baseline scenario and demonstration of additionality” which provides for the application of the “Combined tool to identify the baseline scenario and demonstrate the additionality of the CDM A/R project activities”. The application of the tool is detailed in section 3.5 below.

The identified baseline scenario is the continuation of land use practices that existed prior to the PAI, i.e. non-forested areas.

3.5 Additionality

The applied methodology AR-ACM0003 version 02.0 recommends the use of the “Combined tool to identify the baseline scenario and demonstrate the additionality of the CDM A/R project activities”, version 01, to establish a baseline and demonstrate additionality. The tool is applicable under the following conditions:

- Forestation of the land within the proposed project boundary performed with or without being registered as an AFOLU VCS project activity shall not lead to violation of any applicable law even if the law is not enforced.

  This grouped project complies with all Brazilian laws and regulations and those of the state of Mato Grosso do Sul, the project’s region, as per Section 1.14 above.

- This tool is not applicable to small-scale afforestation and reforestation project activities.

This grouped project will not develop small-scale forestry projects[17].

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

- The start date of this grouped project is 04/01/2021 which is the date of the first plantings in 581 - São Francisco-Francisco Queiroz farm.
- The incentives from VCU's generation were seriously considered in the decision to proceed with the project activity, as evidenced by:
  - This project activity was originally prepared to seek CDM status in the context of transition to the Paris Agreement, as can be evidenced by its prior consideration submission, uploaded on CDM website in 18/12/2020[18] under the project title "*CO_2 removals through reforestation*".
  - Signing a contract with external consultants;
  - Meetings/training with external consultants for the development of the project.

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

<u>Sub-step 1a.</u> Identify credible alternative land use scenarios to the proposed AFOLU project activity.

Realistic and credible land use scenarios that would have occurred on the lands within the proposed grouped project boundaries in the absence of reforestation project activities under the VCS have been identified. The following alternative land use scenarios have been identified:

- *<u>Scenario 1</u>*: Continuation of the pre-project land use.

  <u>Justification</u>: in the absence of this grouped project, the most likely scenario would be the continuation of pre-existing land use, that is, non-forested areas. As further discussed below, the traditional land use in Mato Grosso do Sul is pastureland, followed by crops, such as soybeans and others.

- *<u>Scenario 2</u>*: Reforestation of the land within the project's boundaries performed without being registered as an AFOLU VCS project.

  <u>Justification</u>: considering the traditional land use in the MS state and the other barriers listed in the next steps of this section, it is unlikely that the area within the limits of the grouped project would be reforested at the proposed conditions.

[17] See the definition of "SSC A/R CDM project activity" at https://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf

[18] See https://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html.

- *Scenario 3*: Reforestation of at least a part of the land within the boundary of the proposed project at a rate resulting from extrapolation of observed reforestation activities in the geographical area with similar socio-economic and ecological conditions to the proposed grouped project occurring in a period after 31 December 1989 as selected by the PPs.

  Justification: this is a plausible scenario, although not likely.

Outcome of Sub-step 1a: List of credible alternative land use scenarios that would have occurred on the land within the grouped project's boundary:

- *Scenario 1*: Continuation of the pre-project land use.
- *Scenario 2*: Reforestation of the land within the project's boundaries performed without being registered as an AFOLU VCS project.
- *Scenario 3*: Reforestation of at least a part of the land within the boundary of the proposed project at a rate resulting from extrapolation of observed reforestation activities in the geographical area with similar socio-economic and ecological conditions to the proposed grouped project occurring in a period after 31 December 1989 as selected by the PPs.

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

All land use scenarios identified in the Sub-step 1a are in compliance with all mandatory applicable legal and regulatory requirements in Brazil, and the state of Mato Grosso do Sul. There are no laws and regulations that put any impediment to all the scenarios listed in Sub-step 1a. The main laws and regulations that encompass all the credible alternative scenarios above are:

CONSTITUTION OF THE FEDERATIVE REPUBLIC OF BRAZIL 1988. Art. 187. Agricultural policy will be planned and implemented as per the law, with the effective participation of the production sector, involving farmers and rural workers, as well as commercial, storage and transport sectors. § 1º Agricultural planning includes agro-industrial activities, agricultural and livestock, fisheries, and forestry. Art. 23, VIII. Establishes that it is common competence of Federal, State, and Municipal governments to promote agricultural production to organize domestic food supply.

FEDERAL LAW No. 8,171, 17 JANUARY 1991. Refers to agricultural policy: establishes its basis, defines the objectives, and institutional competences, as well as resources and indicates actions and instruments. Agricultural activity, as proposed by the policy, involves the production, processing and commercialization of products, by-products and derivatives, services and inputs from agriculture, livestock, fisheries, and forestry.

STATE LAW No. 1324, OF 7 DECEMBER 1992. Defines the agricultural policy of the State of Mato Grosso do Sul.

<u>Outcome of Sub-step 1b:</u> the scenarios listed below are plausible land use scenarios that are in accordance with Brazilian legislation and the states that are part of the Grouped project limits.

- *Scenario 1*: Continuation of the pre-project land use.
- *Scenario 2*: Reforestation of the land within the project's boundaries performed without being registered as an AFOLU VCS project.
- *Scenario 3*: Reforestation of at least a part of the land within the boundary of the proposed project at a rate resulting from extrapolation of observed reforestation activities in the geographical area with similar socio-economic and ecological conditions to the proposed grouped project occurring in a period after 31 December 1989 as selected by the PPs.

STEP 2. Barrier Analysis

As determined by the applicable methodology, this grouped project has adopted the following steps for analyzing barriers:

<u>Sub-step 2a</u>. Identification of barriers that would prevent the implementation of at least one alternative land use scenarios.

The identified barriers below could prevent the occurrence of the land use scenarios identified in Sub-step 1b. Barriers should not be specific for the project participants but should apply to the proposed ARR project activity as such, even if similar project developers would have developed the project activity. The identified barriers are:

a) Barrier due to traditional local land use;

b) Technical barriers: technology and logistics;

c) Investment barriers;

d) Barriers related to markets and other conditions

<u>Outcome of Sub-step 2a:</u> the barriers that would prevent one or more land uses identified in Sub-step 1b are

a) Barrier due to traditional local land use;
b) Technical barriers: technology and logistics;
c) Investment barriers;
d) Barriers related to markets and other conditions

<u>Sub-step 2b</u>. Elimination of land use scenarios that are prevented by the identified barriers.

a) <u>Barrier due to traditional local land use</u>

According to Mapbiomas (MAPBIOMAS, 2021), the main land use practice in Brazil is pastureland, occupying 154million hectares all over the country (Brazil has 875.2 million hectares), that is, 18% of the territory. And this area can be even bigger if natural pasturelands are considered (46.6million hectares of the country), as well as areas where a mosaic of pastureland & agriculture are patched in a way that is not possible to discriminate one from another through images (45million hectares).[19].

As for the State of Mato Grosso do Sul, the project region, the dominant role played by agriculture and pasturelands is also clear. The state has a surface area of 35,7million hectares, of which 15 million hectares is occupied by anthropized pastureland (42%), 9 million hectares by natural pasturelands[20] (25%), 5 million hectares by other crops (13%), and 5 million hectares by native forests (13%). Thus, whereas 70% of the land-use is based on several crops, including pastureland, only 3% is dedicated to planted forests, approximately, 1 million ha (IBGE, 2020).

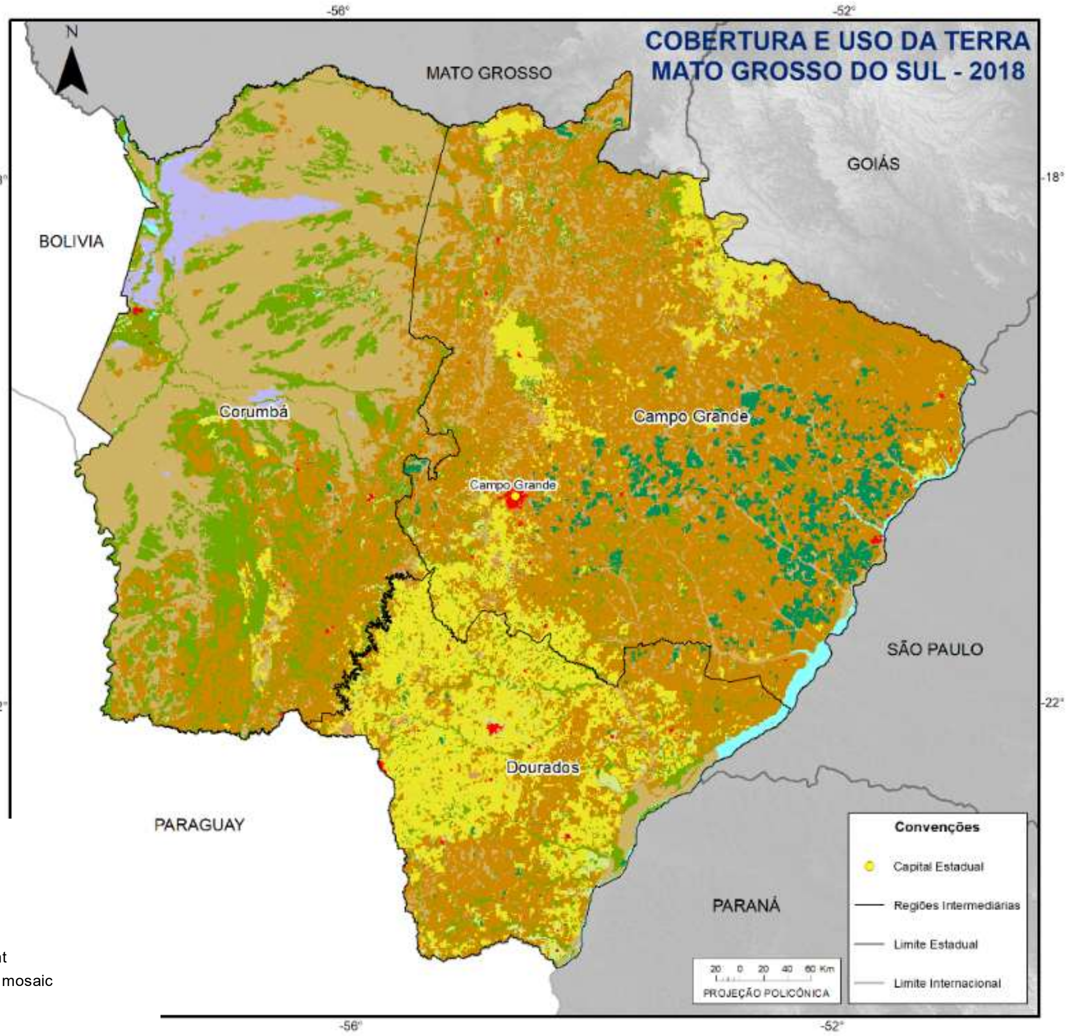
Table 8: occupation of area MS – in hectares, in 2018 (Source: IBGE, 2020)

Grouped project BOUNDARY	AREA (ha)	AREA AGRO+PASTURE (ha)	TOTAL AREA %	NATURAL PASTURELAND (ha)	TOTAL AREA %	PLANTED FOREST (ha)	TOTAL AREA %
Mato Grosso do Sul	35,714,553	19,537,100	55%	8,985,300	25%	1,071,400	3%

Figure 19: Land use map – state of Mato Grosso do Sul, 2018 (Source: IBGE, 2020)

[19] See https://www.gov.br/agricultura/pt-br/assuntos/noticias/valor-da-producao-agropecuaria-de-2021-atinge-r-1-129-trilhao#:~:text=Em%202021%2C%20o%20Valor%20Bruto,(R%24%201%2C025%20trilh%C3%A3o).

[20] According to IBGE, “Due to the difficulty of visually discriminating grassland vegetation with or without grazing, this class includes both, and part of it is, therefore, subject to grazing and other low-intensity anthropic interferences.”



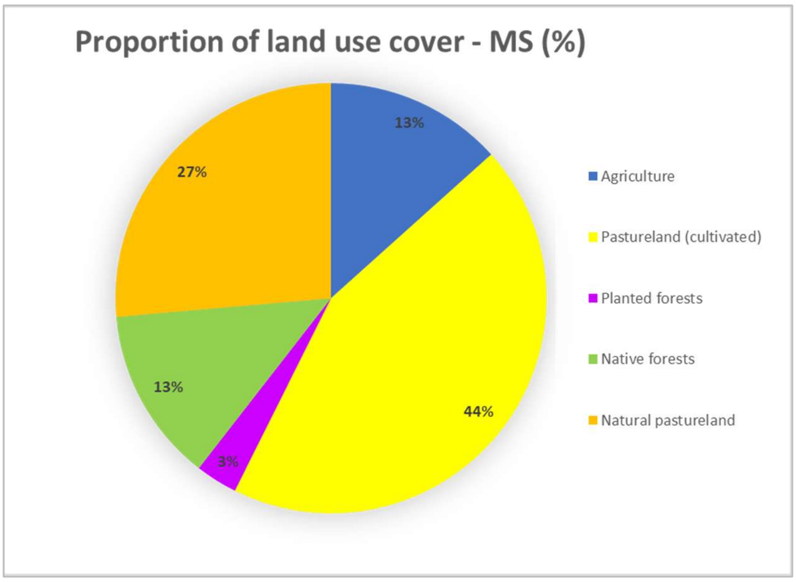
Key

- Artificial area
- Agricultural area
- Grazing with management
- Forest area – occupation mosaic
- Forestry
- Forest vegetation
- Wetlands
- Rural vegetation
- Rural area – occupation mosaic
- Continental body of water
- Coastal body of water
- Non-covered area

Source: IBGE, 2020[21]

Figure 20: Total area of the state of Mato Grosso do Sul for the mainland uses in 2018.

[21] See https://www.ibge.gov.br/apps/monitoramento_cobertura_uso_terra/v1/



Source: Produced originally based on IBGE, 2020

Such a development model dates from a long time. Still in the colonial period, the settlement process of the state of Mato Grosso region (which in the 1970s was divided into two states, Mato Grosso and Mato Grosso do Sul) started with plant extraction activities, especially of yerba mate. However, the conquest and effective occupation of Mato Grosso do Sul were a consequence of cattle raising activity and, later, agriculture. Cattle ranching has followed since the beginning the expansion of the Brazilian territory inwards, serving as a means of subsistence for miners especially after the discovery of precious minerals in the interior of Brazil.

At the end of the 19th century, the opportunity to raise cattle, explore native yerba mate and deploy polycultures attracted migrants to the state of Mato Grosso, supplying workers and the local population with meat and other derivatives until it became the main economic activity after 1930. During this period, while the Southeast region of Brazil was beginning to industrialize, it was the role of the entire Central-West region to provide food and other primary goods to assist the industrialization process, even encouraged by governmental programs for colonization of the region. In the 1940s, cattle raising took on the role of the main economic activity of Mato Grosso, and from 1950 companies began investing in cold storage warehouses expanding the activity to the extreme south of the state and other areas of the Central-West; Mato Grosso do Sul has undertaken the role of supplier of primary products, relying on cattle ranching as its main activity.

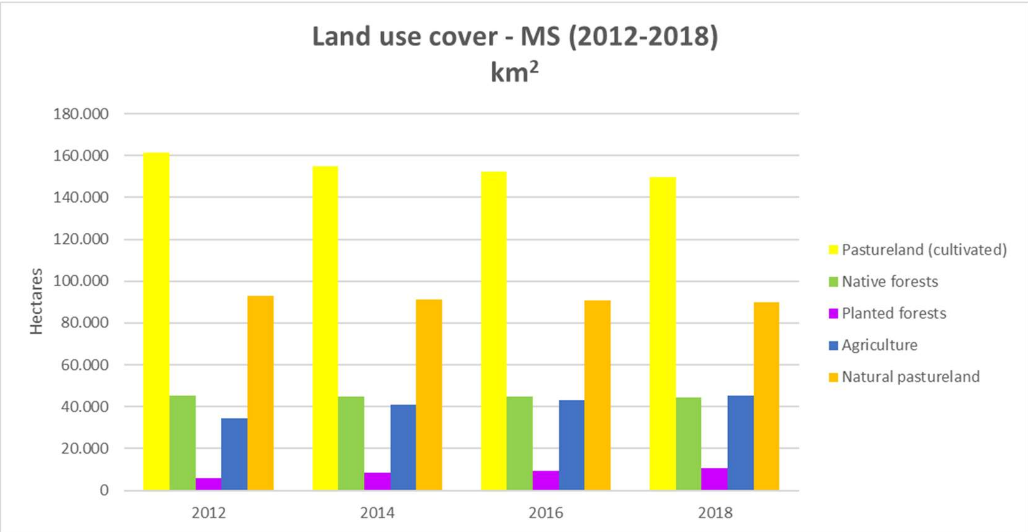
From the 1970s onwards, government programs for the expansion and development of the Central-West enabled the region to concentrate the largest cattle herd in the country. However, in the early 2000s, cattle raising was surpassed by modern export agriculture (UFGD, 2014[22]). For instance, when statistics

[22] See https://anaisonline.uems.br/index.php/enic/article/download/2224/2113. Accessed May 2022.

of corn crops started to be made in the 1980's, Mato Grosso do Sul produced 250,000 tons of corn; in 2010 corn production reached 3.75million tons. Planted area is nowadays nine times bigger than 30 years ago. And soybean crops have also reached staggering figures. In the last 11 years, productivity was boosted by the conversion of more than 3 million hectares of pasture areas into agriculture and was enhanced by technology, meaning 9.2% in productivity growth in the same period (GOV-MS, 2022[23]). 2020/2021 harvest was the biggest in the state's history: 13.3million tons of soybeans. Throughout the years, different varieties of corn and soybean were developed to grow and produce in the Central-West (AGROLINK, 2022[24]). And to keep up with this profitable market, the producers professionalized, becoming highly technical, invested in machinery and labor, learnt all about their lands, and how to take care of their assets (G1, 2011[25]).

In recent years, there has also been growth in silviculture activities, however total figures are still much less representative than the path-dependent agro-based development model (3% compared to 70%).

Figure 21: Total area of the state of Mato Grosso do Sul for the mainland-uses in 2018



(Source: based on IBGE, 2020)

Data makes it clear that agriculture and cattle raising activities are intrinsically to the development of Mato Grosso do Sul, as deeply rooted activities. Thus, considering that land use in the grouped project region is predominantly agriculture and pasture, and the small share of reforestation activities, it is clear

[23] See http://www.ms.gov.br/ms-ja-detem-10-das-exportacoes-brasileiras-de-carne-e-dribla-perdas-do-agro-com-tecnologia/#:~:text=O%20Mato%20Grosso%20do%20Sul,4%C2%AA%20posi%C3%A7%C3%A3o%20no%20ranking%20nacional

[24] See https://www.agrolink.com.br/culturas/soja/informacoes/historico_361541.html.

[25] See https://g1.globo.com/mato-grosso-do-sul/noticia/2011/08/pioneiros-na-agricultura-de-ms-contam-historias-de-sucesso.html.

that the most likely land use scenario within the limits of the grouped project, in the absence of the project, would be non-forested lands due to the prevailing land use.

b) Technical barriers: technology and logistics

The lack of knowledge to deal with technological and logistical aspects is also a substantive challenge for reforestation in the project region, as a culture that is not part of the traditional land use and depends on long term planning.

Advanced forestry techniques are required to couple with uncertainties throughout forest cultivation, such as soil assessment and management, access and use of proper species and genetic material, machinery for planting and harvesting operations, pest and ant control, adaptation of a long-term culture do climate and whether events, long term planning and monitoring capabilities, inter alia (Valeri, 2016).

In the case of use of adequate genetic materials, research and development is concentrated in the private sector and traditional farmers have difficulties in obtaining the best materials vis-à-vis the long-term market potential in the region, which is a key determinant of productivity and market access, influencing customer (Motta et al, 2010). Properly trained or experienced employees are difficult to find and retain, professionalization, training takes time and workforce represents a major part of forest quality (Morais Filho, 2006).

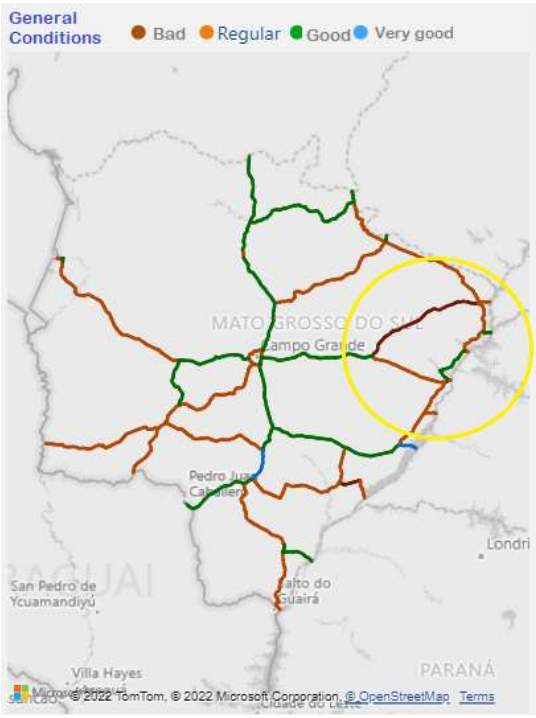
Lack of availability or uncertainties regarding the supply of proper seedlings is also a relevant issue since it reinforces the perception of higher long-term risks in comparison with traditional cultures. The way of overcoming scarcity in the supply of tree seedlings is often the investment in nurseries to produce and stock them. On the other hand, traditional cultures do not face the same uncertainties as there is wide availability of seedlings for multiple types of crops (see also market and other barriers). As such, whereas forest investments are likely to require investments in the production of seedlings, the use of traditional crops are based on the simple purchase of available seedlings.

The planning and operation of logistical processes is also more complex. Differently from traditional crops, used to the logistics of silos or to the concentration of herds, the transportation of wood inside proprieties has to be coordinated for each harvesting plot. Heavy trucks must have access to each plot, making it difficult to concentrate cargo in single points that lead to the optimization of freights. Additional expertise when compared to the prevailing land use is especially required for such operations, in addition to the need for managing substantial operational and safety risks (Oliveira, 2008).

Transportation outside of the propriety is mostly restricted to roads, that represent 64.9% of the national cargo and more than 90% of passenger segments in Brazil (AGENCIA CNT, 2021). This However, several Brazilian roads face a bad situation outside the axes of large capitals, being precarious, poorly maintained and signed and, in most cases, unpaved (CNT, 2021), which is the case of roads that give access to plantations in the innermost areas. To illustrate, only 12.4% of the Brazilian road network had paved highways in 2019 (about 25 km for every 1,000 km² of area) (CNT, 2021). In the case of reforestation at scale, as proposed by the project, it is worth reminding that planting and management activities may be carried out in places of difficult access, making the need the opening and renovation of dirt roads ubiquitous in order to enable harvesting possible.

In Mato Grosso do Sul, in 2018, a survey of the State Secretariat of Infrastructure pointed out that 44,200 km out of the 60,200 km of the state's highways are primary dirt roads, that is, not meeting the road standards for geometric design (SEINFRA, 2018). Also, 95.3% of roads are single two-way lanes (in many stretches without road shoulders) and only 4.1% are dual carriageway; 91% are worn out (i.e. present cracks, holes, corrugation and shoving); only 9% are in perfect condition (CNT, 2021). Also, as a state predominantly focused on livestock and agriculture, freight values are strongly influenced by grain harvesting seasons (UOL, 2022).

Figure 22: general conditions of roads in the state of MS



Source: CNT, 2021

Export-related infrastructure is a key challenge. At current times for example, there is no availability (if any, under very scarce terms) of harbor terminals and loading equipment properly prepared for the export of wood. Even large-scale companies have difficulties in finding adequate structure for the export related products such as pulp, often requiring specific investments in harbor terminals. So, most players depend on the use of scarce existing harbor structure or on expansions to be developed by the government or other private actors, further enhancing uncertainties and the perception of long-term vulnerability regarding demand drivers and the capability of matching long-term delivery and supply.

Continuation of the present land use, however, does not call for major knowhow on the part of rural producers, since crop farming and livestock is a widely disseminated activity in the project region for decades, with more readily available labor to hire, as the expertise in classical agricultural techniques, skills, internal and external logistics are widespread.

b) Investment barriers

Developing reforestation activities involve a significant level of uncertainty, especially in comparison with traditional crops. Forest production requires long periods of investment maturity, depending on the eucalyptus cycle in Brazil, whose first harvest occurs only around the seventh year after planting. The first investment cycle that usually ranges from 14 to 28 years (Penteado, 2017[26]). In other words, the producer has a high disbursement at the beginning of the period but must wait approximately 7 years for the first source of revenue to occur, assuming various risks related to the development of the forest and the dynamics of the market during the long periods between planting and harvest.

Differently from perennial crops, the exposure of volatility of key economic parameters such as costs and prices is substantially higher given the longer time to investment maturity. Starting with the planting areas, the dilemma between buying or leasing an area is relevant, as this is the first significant disbursement to be considered by the producer. Similarly, the technical-silvicultural planning should be detailed, covering aspects such as species to be planted, distribution in the area, environmental and social impacts, among others. implementing a reforestation project requires a significant investment of financial resources, especially considering the time spent on planning, and hiring/training of personnel, as the need for silvicultural expertise will be determinant for success or failure (NATURE, 2022).

For at least the initial rotation, approximately 7 years, the producer is locked into a long-term investment, different from traditional crops, including pastureland and soybeans, which pose less difficulties to change given the short cycle. In addition, in several cases, rural producers may carry out up to two harvests in a single year, including different crops (FUNTRAB, 2022). So, the possibility of annual returns coupled with diversification opportunities and a path-dependent prevailing land-use culture provide a stark contrast to the dynamics of investing in reforestation.

As such, the debt financing structure is substantially different from traditional crops. Grace periods and overall duration must be much longer. In order to enable a fully matched cash flow, consistent with harvesting times, loans would require at least a 7-year grace period, when the first revenues would take place. This is not the most attractive debt arrangement for private financial institutions, hence public bodies are further pressed. To illustrate such difficulties, less than 2% of Brazil's key debt funding program for agriculture ((Low Carbon Agriculture Program – ABC Program[27]) in the last 10 years were

[26] See https://www.embrapa.br/florestas/transferencia-de-tecnologia/eucalipto/perguntas-e-respostas.

[27] Agroicone, 2020.

dedicated to reforestation activities. In addition, Brazil has been experiencing highest basic interest rates in the world, close to 9% on average over the last 10 years (Bacen, 2022)

Land-use arrangements are also substantially more complex, especially under leasing terms, which is a fundamental alternative to optimize long-term disbursements. Whereas, traditional crops may establish short terms leasing contracts, reforestation leasing arrangements require at least 15-year long contracts, so that at least two harvests may take place. Such a longer term makes it more difficult to find land-owners that are willing to lock-in their lands for such a period of time in Brazil, a country with many land-use opportunities.

Without any incentives it is highly unlikely that producers would migrate from traditional, often familiar land-use activities related to perennial crops to face the challenges and uncertainties of a new and risky activity.

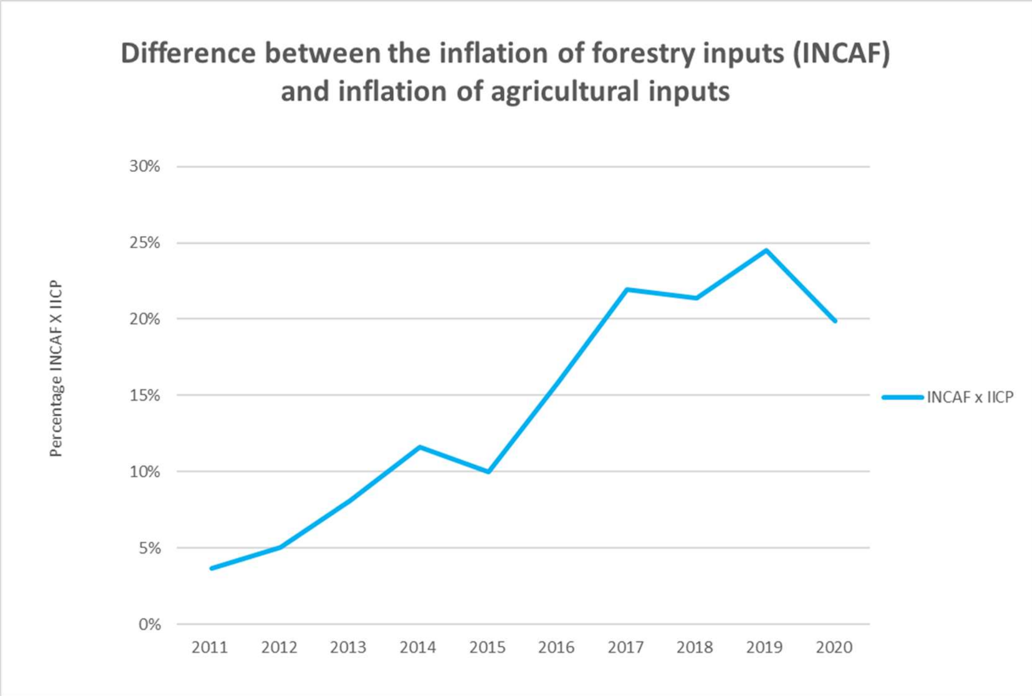
However, continuation of the present land use does not call for major knowhow on the part of rural producers, since agriculture is a widely disseminated activity in the project region.

c) Market and other related barriers

One of the key differences between reforestation activities and the prevailing land use is the way the respective markets are structured. Differently from wood, traditional agriculture products are treated as global commodities, having access to greater liquidity and structured transactions consistent with both short term and long-term planning within stock exchanges and future markets (TOTVS 2020).

The shorter rotation of traditional crops implies a better perception of risk management vis-à-vis reforestation, which leads to greater unpredictability in terms of prices. As an example, agriculture producers are capable or reacting more quickly to price variations and expectations, based on annual decisions that affect costs and prices. On the other hand, wood producers need to constantly assess the present situation and the expected price scenario seven years later in a market that is subject to spot transactions. It is also important to note that over the past ten years, the inflation applicable to forest inputs has been increasing at a faster pace when compared to general rural production costs as a proxy.

Figure 23: Difference between the inflation of forestry inputs (INCAF) and inflation of agricultural inputs

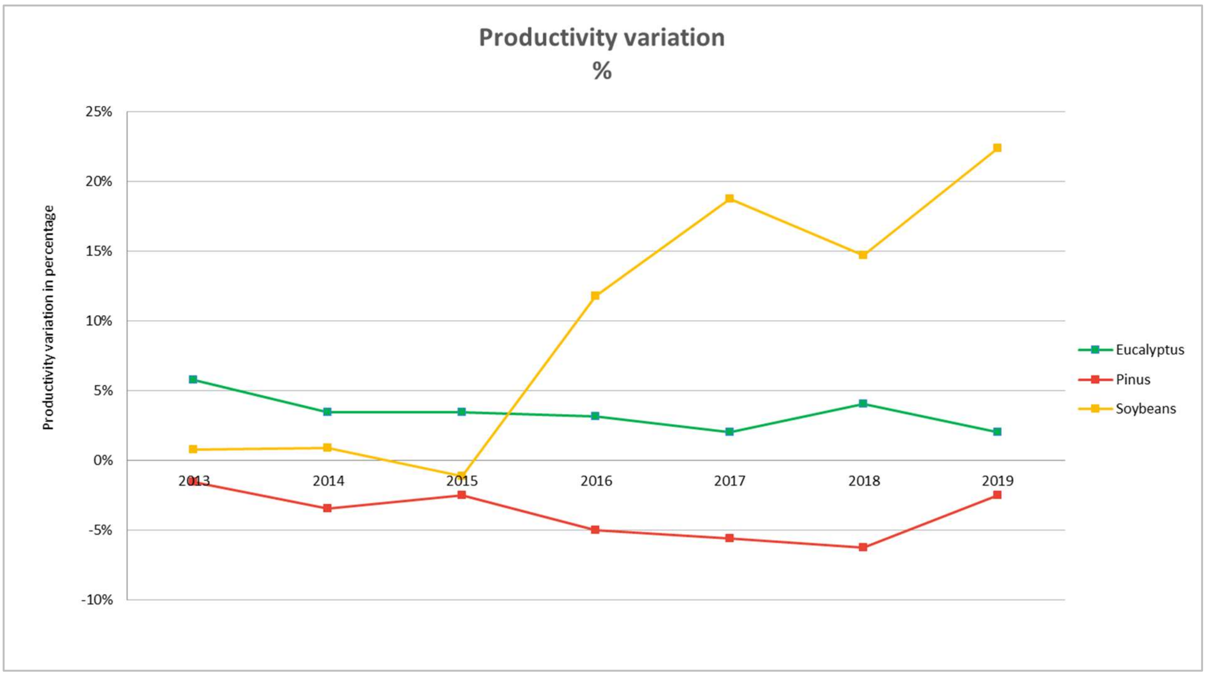


Source: INCAF, IICP

Higher long-term unpredictability also influences the capability to react to operational risks, in light of external events. For instance, in case of fires, pest attacks and other human-based or nature-based events, the impact in reforestation affects a seven-year investment, with shorter margins for proper reaction. If the same events occur in annual crops, the impact is restricted to that year or other short periods, given the rotation time (Valverde et al. 2005[28]). Negative impacts that affect wood productivity unlikely to be recovered in its maturity cycle. In addition, productivity of traditional crops has been increasing more than wood, further strengthening the prevailing risk perception, as per the graph below.

Figure 24: Variation in productivity of agricultural products and Eucalyptus

[28] Valverde et al., 2005. Ver: http://www.remade.com.br/br/revistadamadeira_materia.php?num=689&subject=Reflorestamento&title=Mercado%20da%20madeira%20de%20reflorestamento%20no%20Brasil.



Source: Iba and Conab

The diversity of species available for different cultures also illustrates the flexibility that benefits traditional land use vis-à-vis forestry activities. The number of cultivars for traditional crops, such as soybeans and corn, is approximately 5 to 7 times higher than the amount available for reforestation activities based on eucalyptus (MAPA, 2022). Thus, in addition to the possibility of at least annual vintages, the higher diversity of genetic material is more favorable to the adaptation or reaction to external events and hence a lower risk associated with either market or changing ecological conditions. Also, genetically modified organisms are already allowed[29] and available for in the production of agricultural crops in Brazil, including soybeans and others, further improving productivity and the same conditions are not observed for forestry production[30].

Outcome of Sub-step 2b: List of land use scenarios that are not prevented by any barrier. The only land-use scenario that is not affected by the analysed barriers is *Scenario 1* Continuation of the pre-project land use.

Substep 2c. Determination of baseline scenario (if allowed by the barrier analysis)

[29] See Law nº 11.105, 24 March, 2005.

[30] See https://br.fsc.org/br-pt/newsfeed/fscr-divulga-a-nova-avaliacao-nacional-de-risco-para-o-brasil.

To determine the baseline scenario, the decision tree proposed by the methodological tool was applied to the outcome of Sub-step 2b:

a) *Is reforestation (not registered as an VCS project) included in the list of land uses that are not prevented by barriers?*

No. The list of land-use scenarios that are not prevented by the analysed barriers at the end of Substep 2b contains only one remaining scenario: *Scenario 1* - Continuation of the pre-project land use.

b) *Does the list contain only one land-use scenario?*

Yes. *Scenario 1* - Continuation of the pre-project land use is not prevented by any barriers.

Continue with Step 4: Common practice test

STEP 4: Common Practice Analysis

As initially demonstrated in Sub-step 2b(a), reforestation activities are not the common practice in the project region, representing only 3% of the land use, whereas 80% is dominated by pastureland and traditional crops (IBGE, 2020).

There are three ARR projects registered under VERRA in the project region, also relying on carbon benefits: *2079 Fazenda Nascente do Luar Agroforestry Project, 1663 Fazenda Sao Paulo Afforestation* and *3350 The ARR Horizonte Carbon Project.* Nonetheless, according to the combined tool, other registered AFOLU project activities shall not to be included in this analysis.

The proposed Future Green Carbon Project under development by Eldorado, encompasses very large-scale reforestation activities, initially amounting to an area of 32,226.25 hectares with a potential to reach 100,000 hectares in a near future. The successful implementation of the Project will result in one of the largest ARR activities not only in the State but in all the Central-West region, which is a key Brazilian region for the expansion of traditional crops.

The key highlight of the proposed project is the approach of intertwining reforestation activities with the recovery and conservation of forest areas devoted to sustainable development benefits. This includes the generation and maintenance of carbon stocks, which will not be claimed as VCUs, but also relevant benefits ranging from biodiversity and water resources conservation. In its first instance, it is estimated that approximately 15,000 hectares will be devoted to conservation and recovery.

Setting aside areas for conservation purposes is part of the Brazilian Forest Code, either through permanent preservation areas (where natural characteristics must be maintained, not necessarily linked to the type of vegetation cover) or legal reserves (generally aimed at preserving native vegetation cover). The project will enable the recovery of such lands, whenever applicable, often going beyond what is required by law. VCUs will not be claimed for such areas, although recovery and conservation actions will benefit from VCUs claimed for the reforestation areas, hence the synergies and integrated rationale of the project.

Thus, considering both types of land cover, i.e. reforestation or recovery and conservation of native vegetation, the project will encompass an area of approximately 47,000,000 hectares, representing a portfolio of forestry actions, whereby approximately 70% of such lands are reforestation activities, which, under the project concept, enable the recovery and conservation of approximately 30% of lands with native vegetation. The project is expected to allow for the connectivity of large portions of native vegetation fragments throughout the planted forests (ecological corridors). Such a measure represents a substantive change in comparison to traditional or previous land management, enabling the establishment of an integrated landscape mosaic approach that allows for a sustainable balance between production and conservation areas.

As part of the actions towards the recovery and conservation of native vegetation, several human induced measures will be implemented such as:

- soil conservation actions, based on a specific erosion recovery program that will be applied to degraded areas that become part of the project, including actions such as mapping, planning, correcting and monitoring areas of risk;
- permanent monitoring, to avoid inappropriate uses or to identify external threats;
- assisted natural regeneration: whenever the restoration target is not met, alternative reforestation practices will be applied, such as the locally known “muvuca”, that consists of an indigenous technique of mixing diverse native species seeds, of different sizes, growth characteristics and successional categories for maximum advantage, and ecological bird perches, to attract seed dispersal agents. If the action on the area destined for conservation is not satisfactorily achieved, enrichment will be carried out through the planting of native seedlings to ensure the recovery of these areas. All seedlings and seeds are from species identified in the region through environmental monitoring and bibliographic references.
- fencing;
- the establishment of ecological corridors, aimed at connecting different native vegetation fragments throughout the proprieties and strengthening biodiversity;
- Environmental monitoring and evaluation of the effects of the project activities on the ecosystem, including the use of new technologies, such as drones, and geoprocessing;
- Assisted monitoring of biodiversity, with a special focus on mastofauna and the dynamics of wildlife within the project operations.

All of these actions and the overall effect of the project become even more clear when one considers that the project region (State of Mato Grosso do Sul) has historically lost more than 75% of its original vegetation cover within the Cerrado biome (Correio do Estado, 2015). So, the project is expected to make a substantive contribution to enhance different types of carbon stocks, in contrast with a historical context of carbon losses.

Other important benefit triggered by the grouped project Future Green Carbon Project is the expansion of the forest fire surveillance network. The project's carbon revenue will assist in the enhancement and implementation of new fire prevention systems including the construction of fire towers (see Section 1.11 above), preventing the irreparable loss of biodiversity and the GHG emissions caused by fire. This benefit will reach not only the project areas, but also the surrounding communities. This is particularly relevant for the region, that has been facing alarming fire events in the last years[31].

In addition, in consistency with a broader sustainable development approach, several measures associated with local social and economic development will also be strengthened or implemented, based on the carbon revenue generated by the project. Management of such measures will be performed in light of the sustainable development goals (SDGs), presented in further detailed in Section 1.17 (not re-listed herein to avoid repetition).

Projeto Raizes (The Cassava Project)

The aim of the project is to diversify production in small rural properties, focusing on cassava and, consequently, increasing income.

The cassava cultivation is the highlight of plant production in the region for its importance in human and animal diet (it is used as a raw material for numerous industrial products e.g. cassava flour, "*biju*", tapioca starch, animal feed, etc.) and because it is hard to get other products due to the long distances and difficult access to some communities and settlements. The carbon revenues will allow to increase the number of families and regions benefited and, in addition, will enable the implementation of the second stage of the *Raízes*, which consists of the creation of a cooperative for these small producers and a cassava processing plant to add value to the final product.

PAIS Project (Integrated and Sustainable Agroecological Production)

It is a social technology that provides small farmers with the practice of organic agriculture, that is, producing without pesticides, aiming at preserving the environment, providing food security and promoting economic development. The project will be expanded in partnership with SEBRAE/MS - Brazilian Micro and Small Business Support Service[32] in Mato Grosso do Sul, and will offer training and agricultural production materials to neighboring families, as applicable. The main goal of the project is to create job opportunities and income in family farming, strengthening local potential and providing better conditions of food and access to the consumer market.

[31] See https://midiamax.uol.com.br/cotidiano/2022/predominante-em-ms-cerrado-foi-o-bioma-mais-devastado-por-queimadas-em-setembro-de-2022/.

[32] See https://sebrae.com.br/sites/PortalSebrae/canais_adicionais/sebrae_english.

The Orchard Project

The carbon credits will enable the implementation of the Orchard Project in the vicinity of the project areas, which will provide certified Tahiti lemon seedlings and drip irrigation kits to local producers. Technical assistance will also be offered by the National Rural Learning System - SENAR, which will guide producers throughout the implementation phase until production, instructing on the techniques of fruit growing and sales and negotiation.

The Countryside Coffee Project

This project's goal is to incentivize local communities through the acquisition of handmade products for coffee breaks at events. All products are produced with natural ingredients from the farmers' own gardens, using seasonal fruits and homemade recipes, which are most often passed down from generation to generation.

Eldorado Sustainability Program (PES)

The aim is the development of environmental education activities and social actions in the project areas' municipalities on three tracks:

- PES Schools: aiming at Elementary school students and teachers, and employees of municipal and state schools in the project region.
- PES Communities: bring to the communities information on the Future Green Carbon Project purposes and actions, and about quality of life.
- PES Employees: aiming at socio-environmental education activities with the project's employees.

Eldorado Values Educational Program at schools:

The main objective of this program is to bring knowledge to the students of municipal schools in the region on topics such as good environmental practices, the importance of eucalyptus in the conservation of biodiversity, climate change, sustainability, action in the prevention of forest fires and the production of renewable energy.

→ If Step 4 is satisfied, i.e. similar activities can be observed and essential distinctions between the proposed CDM project activity and similar activities cannot be made, then the proposed CDM project activity is not additional. Otherwise, the proposed A/R CDM project activity is not the baseline scenario and, hence, it is additional.

As a conclusion, considering its scale, integrated approach involving a wide range of actions intertwining reforestation and recovery/conservation and its sustainable development component, the proposed project activity is *not* similar to any other activity observed and is *not* common practice. So, the proposed ARR project activity is not the baseline scenario and, hence, is additional.

However, for the sake of conservativeness, this project activity will apply the A/R rate resulting from the extrapolation of observed reforestation activities in the geographical area with similar socio-economic and ecological conditions to the proposed grouped project occurring in a period after 31 December 1989 as selected by the PPs, as per Scenario 3 and the combined tool. Then, a rate of 3%, which is the baseline rate of forestation (percentage of planted forests in the state of Mato Grosso do Sul according to the Brazilian Institute of Geography and Statistics – IBGE, as seen in Table 8 above), will be discounted from the total GHG removals generated by this project activity.

3.6 Methodology Deviations

Not applicable. This grouped project proposes no deviation to the applied methodology.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

4.1.1 Baseline net GHG removals by sinks

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t}$$

Equation 1[33]

Where:

$\Delta C_{BSL,t}$ = Baseline net GHG removals by sinks, *t*; t CO_2-e

[33] For Equation 1 the numbering adopted in the *AR-ACM0003* methodology was maintained.

$\Delta C_{TREE\_BSL,t}$	=	Change in carbon stock in baseline tree biomass within the project boundary in year *t*; as estimated by the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*"; t CO_2-e
$\Delta C_{SHRUB\_BSL,t}$	=	Change in carbon stock in baseline shrub biomass within the project boundary in year *t*; as estimated by the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*"; t CO_2-e
$\Delta C_{DW\_BSL,t}$	=	Change in carbon stock in baseline dead wood biomass within the project boundary in year *t*; as estimated by the tool "*Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities*"; t CO_2-e
$\Delta C_{LI\_BSL,t}$	=	Change in carbon stock in baseline litter biomass within the project boundary in year *t*; as estimated by the tool "*Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities*"; t CO_2-e

4.1.1.1 Carbon stock in trees in the baseline (Pre-project trees)

The determination of carbon stock in pre-existing trees in each instance is calculated according to item 5.11 of version 04.2 of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*", following items below.

1) The carbon stock in pre-existing trees may be considered as zero if:

   (a) *"The pre-project trees are neither harvested, nor cleared, nor removed throughout the crediting period of the project activity;*

   (b) *The pre-project trees do not suffer mortality because of competition from trees planted in the project, or damage because of implementation of the project activity, at any time during the crediting period of the project activity;*

   (c) *The pre-project trees are not inventoried along with the project trees in monitoring of carbon stocks but their continued existence, consistent with the baseline scenario, is monitored throughout the crediting period of the project activity."*

   (d) there are no pre-existing trees in the baseline.

The previous land use was determined as non-forested lands, especially agriculture and pasture. Although there may be some trees in the areas, their density will not characterize forest formation according to Brazil's definition of forest. Preferably, the pre-project trees in the project boundary will not be harvested and other forestry and planting activities will be carried out as to avoid competition with existing trees. However, whenever pre-project trees occur in the project boundary, the instance implementer could:

i) Georeference the pre-project trees, at the time of inclusion of the instance, to monitor their survival during the crediting period of the project (if the isolated trees are not georeferenced, conservatively, instance implementer shall apply the baseline discount of these trees); and/or

ii) Harvest the pre-project trees and apply the baseline discount, as below.

In case the PP opts to apply the discount in a given instance, the carbon stock in the biomass of trees in the baseline within the project boundary could be estimated by **stratified random sampling** (Option 1), **census** (Option 2) or estimation by **proportionate crown cover** (Option 3). According to the density of pre-project trees the project implementer could opt for one of the possible options of measurements:

- Option 1 - stratified random sampling: most suitable for areas with higher density of trees. It is estimated by measurement of sample plots using **stratified random sampling**, as described in section 8 (8.1.1) of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*", version 04.2;
- Option 2 – census: most suitable for areas with lower density of trees. It is calculated through the census of the area.
- Option 3 – proportionate crown cover: only applicable for "estimation of the pre-project carbon stock in tree biomass in the baseline where the mean pre-project tree crown cover is **less than 20 per cent** of the threshold tree crown cover reported by the host Party under paragraph 8 of the annex to decision 5/CMP.1", as per item 8.3 of "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*", version 04.2.

Option 1 (measurement of sample plots; stratified random sampling):

$$C_{TREE\_BL} = \frac{44}{12}\, x CF_{TREE\_BL} x B_{TREE\_BL}$$ Equation 12[34]

$$B_{TREE\_BL} = A\ x\ b_{TREE\_BL}$$ Equation 13

[34] For Equations 12 to 17, the numbering adopted in the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

$$b_{TREE\_BL} = \sum_{i=1}^{M} w_i \; x \; b_{TREE\_BL,i}$$ Equation 14

$$u_{C\_BL} = \frac{t_{VAL} \; x \; \sqrt{\sum_{i=1}^{M} w_i^2 \; x \; \frac{s_i^2}{n_i}}}{b_{TREE\_BL}}$$ Equation 15

$$b_{TREE\_BL,i} = \sum_{p=1}^{ni} b_{TREE\_BL,p,i}$$ Equation 16

$$s_i^2 = \frac{n_i \; x \; \sum_{p=1}^{ni} b_{TREE\_BL,p,i}^2 - (\sum_{p=1}^{ni} b_{TREE\_BL,p,i})^2}{n_i \; x \; (n_i - 1)}$$ Equation 17

Where:

C_{TREE_BL}	=	Carbon stock in trees in the tree biomass estimation strata in the baseline; t CO_2e
CF_{TREE_BL}	=	Carbon fraction of tree biomass; t C (t d.m.)$^{-1}$. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
B_{TREE_BL}	=	Tree biomass in the tree biomass estimation strata in the baseline; t d.m
A	=	Sum of areas of the tree biomass estimation strata; ha
b_{TREE_BL}	=	Mean tree biomass per hectare in the tree biomass estimation strata in the baseline; t d.m. ha^{-1}
w_i	=	Ratio of the area of stratum *i* to the sum of areas of tree biomass estimation strata (i.e./); dimensionless
$b_{TREE\_BL,i}$	=	Mean tree biomass per hectare in stratum *i*; t d.m. ha^{-1}
u_{C_BL}	=	Uncertainty in C_{TREE_BL}
t_{VAL}	=	Two-sided Student's t-value for a confidence level of 90 per cent and degrees of freedom equal to n – M, where n is total number of sample plots within the tree biomass estimation strata and M is the total number of tree biomass estimation strata

s_i^2	=	Variance of tree biomass per hectare across all sample plots in stratum *i*; (t d.m. ha^{-1})^2
n_i	=	Number of sample plots in stratum *i*.
$b_{TREE\_BL,p,i}$	=	Biomass of tree in the baseline per hectare in plot p of stratum *i*; t d.m. ha^{-1}

In this context, the **biomass of the trees per hectare** will be calculated as detailed in the Appendix 1 of the tool *"Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2*.

$$b_{TREE\_BL,p,i} = \frac{B_{TREE\_BL,p,i}}{A_{PLOT,i}} \times (1 + R_i)$$ Equation 1[35]

$$B_{TREE\_BL,p,i} = \sum_j B_{TREE\_BL,j,p,i}$$ Equation 2

$$B_{TREE\_BL,j,p,i} = \sum_l B_{TREE\_BL,l,j,p,i}$$ Equation 3

$$B_{TREE\_BL,l,j,p,i} = f_{BL,j}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots)$$ Equation 4

Where:

$b_{TREE\_BL,p,i}$	=	Tree biomass per hectare in sample plot *p* of stratum in the baseline *i*; t d.m. ha^{-1}
$B_{TREE\_BL,p,i}$	=	Tree biomass in sample plot *p* of stratum *i* in the baseline; t d.m
$A_{PLOT,i}$	=	Size of sample plot in stratum *i* in the baseline; ha
R_i	=	Root-shoot ratio for stratum *i*; dimensionless

[35] For Equations 1 to 4, the numbering adopted in the Appendix 1 methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

$B_{TREE\_BL,j,p,i}$	=	Biomass of trees of biome *j* in sample plot *p* of stratum *i* in the baseline; t d.m
$B_{TREE\_BL,l,j,p,i}$	=	Biomass of tree *l* of biome *j* in sample plot *p* of stratum *i* in the baseline; t d.m.
$f_{BL,j}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots)$	=	Above-ground biomass of the tree returned by the allometric equation for biome *j* relating the measurements of tree *l* to the above-ground biomass of the tree; t d.m.

The value R_j is estimated as $R_j = \frac{e^{(-1.085+0.9256\times \ln b)}}{b}$, where b is the aboveground tree biomass per hectare (tons of dry matter ha^{-1}), as presented in Appendix 1 of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities", version 04.2*.

<u>Option 2 (census):</u>

$$C_{TREE\_BL} = \frac{44}{12}\, x CF_{TREE\_BL} x B_{TREE\_BL}$$ Equation 12[36]

Where

C_{TREE_BL}	=	Carbon stock in trees in the baseline; t CO_2e
CF_{TREE_BL}	=	Carbon fraction of tree biomass; t C (t d.m.)$^{-1}$. A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.
B_{TREE_BL}	=	Tree biomass in the baseline; t d.m. ha^{-1}

In the context of census, the **biomass of trees** will be calculated as detailed in the Appendix 1 of the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2*.

[36] For Equation 12 the numbering adopted in the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

$$B_{TREE\_BL} = \sum_{i} B_{TREE\_BL,i}$$ Equation 2[37]

$$B_{TREE\_BL,i} = f_{BL,i}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots) \times (1 + R_i)$$ Equation 4

Where:

$B_{TREE\_BL,i}$	=	Biomass of tree of biome (native) or species (exotic) *i* in the baseline; t d.m.
$f_{BL,i}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots)$	=	Above-ground biomass of the tree returned by the allometric equation for biome (native) or species (exotic) *i* relating the measurements of tree l to the above-ground biomass of the tree; t d.m.
R_i	=	Root-shoot ratio for stratum *i*; dimensionless;

The value R_i is estimated as $R_i = \frac{e^{(-1.085+0.9256\times\ln b)}}{b}$, where b is the aboveground biomass of trees per hectare (tons of dry matter ha^{-1}), as presented in the *methodological* tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" Version 04.2*.

<u>Option 3 (proportionate crown cover):</u>

$$C_{TREE\_BSL} = \sum_{i=1}^{M} C_{TREE\_BSL,i}$$ Equation 20[38]

$$C_{TREE\_BSL,i} = \frac{44}{12} \times CF_{TREE} \times b_{FOREST} \times (1 + R_{TREE}) \times CC_{TREE\_BSL,i} \times A_i$$ Equation 21

[37] For Equations 2 and 4, the numbering adopted in the Appendix 1 methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

[38] For Equations 20 and 21, the numbering adopted in item 8.3 of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

Where:

C_{TREE_BSL}	=	Carbon stock in pre-project tree biomass; t CO_2e
$C_{TREE\_BSL,i}$	=	Carbon stock in pre-project tree biomass in stratum *i*; t CO_2e
CF_{TREE}	=	Carbon fraction of tree biomass; t C (t.d.m.)$^{-1}$
b_{FOREST}	=	Mean above-ground biomass in forest in the region or country where the ARR project is located; t d.m. ha^{-1}; Values from Table 3A.1.4 of IPCC GPG-LULUCF 2003 are used unless transparent and verifiable information can be provided to justify different values.
R_{TREE}	=	Root-shoot ratio for trees in the baseline; dimensionless. A default value of 0.25 is used unless transparent and verifiable information can be provided to justify a different value.
$CC_{TREE\_BSL,i}$	=	Crown cover of trees in baseline stratum *i*, at the start of the ARR project activity, expressed as a fraction (e.g. 10 per cent crown cover implies $CC_{TREE\_BSL,i}$ = 0.10); dimensionless;
A_i	=	Area of baseline stratum *i*, delineated on the basis of tree crown cover at the start of the ARR project activity; ha

4.1.1.2 Changes in carbon stocks in trees and shrubs in the baseline

Changes in carbon stocks in trees and shrubs in the baseline may be accounted as zero, according to item 5.12 of the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2, for those lands for which the PP can demonstrate that one or more of the following indicators apply:

a. *"Observed reduction in topsoil depth (e.g. as shown by root exposure, presence of pedestals, exposed sub-soil horizons);*

b. *Presence of gully, sheet or rill erosion; or landslides, or other forms of mass movement erosion;*

c. *Presence of plant species locally known to be indicators of infertile land;*

d. *Land comprises of bare sand dunes, or other bare lands;*

e. *Land contains contaminated soils, mine spoils, or highly alkaline or saline soils;*

f. *Land is subjected to periodic cycles (e.g. slash-and-burn, or clearing-regrowing cycles) so that the biomass oscillates between a minimum and a maximum value in the baseline;*

g. *Conditions (a), (b) and (c) under paragraph 11 apply."*

If the presence of shrubs is observed in the baseline condition and these shrubs are harvested, the carbon stock in the biomass of shrubs in the baseline within the project boundary will be estimated by proportionate crown cover, as described section 11 of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2.

Those areas where the shrub crown cover is less than 5 per cent are treated as a single stratum and the shrub biomass in this stratum is estimated as zero. For those areas where the shrub crown cover is more than 5 per cent, the carbon stock in biomass of shrubs in the baseline within the project boundary will be estimated as follows:

$$C_{SHRUB,t} = \frac{44}{12} \times CF_s \times (1 + R_s) \times \sum_i A_{SHRUB,i} \times b_{SHRUB,i}$$ Equation 26[39]

$$b_{SHRUB,i} = BDR_{SF} \times b_{FOREST} \times CC_{SHRUB,i}$$ Equation 27

Where:

$C_{SHRUB,t}$	=	Carbon stock in shrubs within the project boundary at a given point of time in year *t*; t CO_2-e.
CF_s	=	Carbon fraction of shrub biomass; t C $(t.d.m.)^{-1}$. A default value of 0.47 t C $(t.d.m.)^{-1}$ is used.
R_s	=	Root-shoot ratio for shrubs; dimensionless. The default value of 0.40 is used.
$A_{SHRUB,i}$	=	Area of shrub biomass estimation stratum *i*; ha

[39] For Equations 26 and 27, the numbering adopted in the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2* was maintained.

$b_{SHRUB,i}$	=	Shrub biomass per hectare in shrub biomass estimation stratum *i*; t d.m. ha^{-1}
BDR_{SF}	=	Ratio of shrub biomass per hectare in land having a shrub crown cover of 1.0 (i.e. 100 per cent) and the default above-ground biomass content per hectare in forest in the region/country where the A/R CDM project activity is located; dimensionless. A default value of 0.10 should be used unless transparent and verifiable information can be provided to justify a different value.
b_{FOREST}	=	Mean above-ground biomass in forest in the region or country where the A/R CDM project is located; t d.m. ha^{-1}. Values from Table 3A.1.4 of IPCC GPG-LULUCF 2003 are used unless transparent and verifiable information can be provided to justify different values.
$CC_{SHRUB,i}$	=	Crown cover of shrubs in shrub biomass estimation stratum *i* at the time of estimation, expressed as a fraction.

4.2 Project Emissions

Actual net GHG removals by sinks

Actual net GHG removals by sinks are calculated according to the applied methodology and the most recent version of the "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" methodological tool.

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$ Equation 2[40]

[40] For Equation 2, the numbering adopted in the *AR-ACM0003* methodology was maintained.

Where:

$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools in year *t*; t CO_2-e
$GHG_{E,t}$	=	Increase in non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity in year *t*, as estimated by the tool "*Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*"; t CO_2-e

Change in carbon stocks in the project, occurring in selected carbon pools in year *t*.

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$

Equation 3[41]

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in selected carbon pools in year *t*; t CO_2-e
$\Delta C_{TREE\_PROJ,t}$	=	Change in carbon stock in tree biomass in the project in year *t*, as estimated by the "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" tool; t CO_2-e
$\Delta C_{SHRUB\_PROJ,t}$	=	Change in carbon stock in shrub biomass in the project in year *t*, as estimated by the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*"; t CO_2-e

[41] For Equation 3, the numbering adopted in the *AR-ACM0003* methodology was maintained.

$\Delta C_{DW\_PROJ,t}$	=	Change in carbon stock in dead wood in the project in year t, as estimated by the "*Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"* tool; t CO_2-e
$\Delta C_{LI\_PROJ,t}$	=	Change in carbon stock in litter in the project in year t, as estimated by the *"Estimation of carbon stocks and change in carbon stocks in Litter and litter in A/R CDM project activities"* tool; t CO_2-e
$\Delta SOC_{AL,t}$	=	Change in carbon stock in SOC in project, in year t, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO_2-e

Trees (ΔC_{TREE})

Average tree carbon stocks in the stratum, used to estimate tree biomass and associated uncertainties, are calculated as follows (all time-dependent quantities refer to the measurement time):

$$\Delta C_{TREE\_PROJ,t} = C_{TREE}$$

Therefore,

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE}$$ Equation 12[42]

$$B_{TREE} = A \times b_{TREE}$$ Equation 13

$$b_{TREE} = \sum_{i=1}^{M} Wi \times b_{TREE,i}$$ Equation 14

$$u_C = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_i^2}{n_i}}}{b_{TREE}}$$ Equation 15

Where:

[42] For Equations 12 to 15, we have kept the numbering adopted in the *"Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"* methodological tool, version 04.2.

C_{TREE} = Carbon stock in trees in the tree biomass estimation strata; t CO_2e

CF_{TREE} = Carbon fraction in tree biomass; t C (t d.m.)$^{-1}$

A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.

B_{TREE} = Tree biomass in the tree biomass estimation strata; t d.m

A = Sum of areas of the tree biomass estimation strata; ha

b_{TREE} = Mean tree biomass per hectare in the tree biomass estimation strata; td.m.ha^{-1}

Wi = Ratio of the area of stratum *i* to the sum of areas of tree biomass estimation strata (i.e., $w_i = A_i/A$); dimensionless

$b_{TREE,i}$ = Mean tree biomass per hectare in stratum *i*; td.m.ha^{-1}

u_C = Uncertainty in C_{TREE}

t_{VAL} = Two-sided Student's t-value for a confidence level of 90 per cent and degrees of freedom equal to n – M, where n is total number of sample plots within the tree biomass estimation strata and M is the total number of tree biomass estimation strata

s_i^2 = Variance of tree biomass per hectare across all sample plots in stratum *i*; (t d.m. ha^{-1})

n_i = Number of sample plots in stratum *i*.

If the estimate from Equation (15) is higher than 10 per cent, its conservativeness can be increased by applying the uncertainty discount provided in Table 1 of Appendix 2 of the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*", version 04.2.

$$b_{TREE,p,i} = \frac{B_{TREE,p,i}}{A_{PLOT,i}} \times (1 + R_i)$$ Equation 1[43]

[43] For Equations 1, 2 and 4, we have kept the numbering adopted in Appendix 1 of the "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" methodological tool, version 04.2.

$$B_{TREE,p,i} = \sum_j B_{TREE,j,p,i}$$ Equation 2

Where:

$b_{TREE,p,i}$	=	Biomass of trees per hectare in sample plot *p* of stratum *i*; t d.m. ha^{-1}
$B_{TREE,p,i}$	=	Biomass of trees in sample plot *p* of stratum *i*; t d.m.
$A_{PLOT,i}$	=	Size of sample plot in stratum *i*; ha
$B_{TREE,j,p,i}$	=	Biomass of trees of species *j* in sample plot *p* of stratum *i*; t d.m.
R_i	=	Root-shoot ratio for stratum *i*; dimensionless

Value R_i is estimated as $R_i = \frac{e^{(-1.085+0.9256\times \ln b)}}{b}$, where b is the above-ground tree biomass per hectare (tonnes of dry matter ha^{-1}), as presented in the "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities* methodological tool, version 04.2.

$$B_{TREE,j,p,i} = f_j(x_{1,j}, x_{2,j}, x_{3,j}, \ldots)$$ Equation 4

Where:

$B_{TREE,j,p,i}$	=	Biomass of tree *j* in sample plot *p* of stratum *i*; t d.m.
$f_i(x_{1,j}, x_{2,j}, x_{3,j}, \ldots)$	=	Above-ground biomass of the tree returned by the allometric equation for stratum *i* which represents a ratio between measurement of the tree diameter (DBH) and tree height and aboveground tree biomass; t d.m.

The allometric and/or volumetric equation will be used for parameter $B_{TREE,p,i}$, both ex ant and ex post unless new equations obtained from transparent and verifiable data are used.

Shrubs (ΔC_{SHRUB})

For the purpose of ex-ante estimation of carbon stock and change in carbon stock in the project scenario, change in carbon stock of shrubs may be estimated as zero, as described by the methodological tool

"*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2, thus:

$$\Delta C_{SHRUB\ PROJ,t} = 0$$

Emission of non-CO_2 GHG resulting from burning of biomass

According to the applied methodology, the only GHG emissions computed by projects are those resulting from fires, whether accidental or not. The "*Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*"[44] methodological tool is used to calculate GHG emissions from fires.

$$GHG_{E,t} = GHG_{SPF,t} + GHG_{FMF,t} + GHG_{FF,t} \quad \text{Equation 1[45]}$$

where

$GHG_{E,t}$	=	Emission of non-CO_2 GHG resulting from burning of biomass and forest fires within the project boundary in year *t*; t CO_2-e
$GHG_{SPF,t}$	=	Emission of non-CO_2 GHGs resulting from use of fire in site preparation in year *t*; t CO_2-e
$GHG_{FMF,t}$	=	Emission of non-CO_2 GHGs resulting from use of fire to clear the land of harvest residue prior to replanting of the land or other forest management, in year *t*; t CO_2-e
$GHG_{FF,t}$	=	Emission of non-CO_2 GHGs resulting from fire in year *t*; t CO_2-e

The three circumstances admitted by the tool in which there may be GHG emissions in the projects are:

- ✓ Emission of non-CO_2 GHGs resulting from use of fire in site preparation
- ✓ Emission of non-CO_2 GHGs resulting from use of fire to clear the land of harvest residue prior to replanting of the land or other forest management; and
- ✓ Emission of non-CO_2 GHGs resulting from forest fires.

[44] See https://cdm.unfccc.int/methodologies/ARmethodologies/tools/ar-am-tool-08-v4.0.0.pdf.

[45] For Equation 1, 6 and 7, the numbering adopted in the "*Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"* methodological tool, version 04.0.0. was maintained.

In case of forest fires, the area affected will be monitored according to parameter $A_{BURN,i,t}$ described in section 5.2. The emissions of non-CO_2 resulting from forest fire will be calculated as per the tool "*Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*":

$$GHG_{FF,t} = GHG_{FF\_TREE,t} + GHG_{FF\_DOM,t}$$ Equation 6

Where:

$GHG_{FF,t}$	=	Emission of non-CO_2 GHGs resulting from forest fire, in year *t*; tCO_2-e
$GHG_{FF\_TREE,t}$	=	Emission of non-CO_2 GHGs resulting from the loss of aboveground biomass of trees due to forest fire, in year *t*; tCO_2-e
$GHG_{FF\_DOM,t}$	=	Emission of non-CO_2 GHGs resulting from the loss of dead organic matter due to forest fire, in year *t*; tCO_2-e

As the pool *dead organic matter* will not be monitored in this project, the stock of dead organic matter is considered <u>zero</u> and emissions of non-CO_2 GHGs resulting from the loss of dead organic matter due to forest fire are not accounted.

$GHG_{FF\_DOM,t} = 0$

$$GHG_{FF\_TREE,t} = 0.001 * \sum_{i=1}^{M} A_{BURN,i,t} * b_{TREE,i,t_L} * COMF_i * \left(EF_{CH4,i} * GWP_{CH4} + EF_{N2O,i} * GWP_{N2O}\right)$$ Equation 7[46]

where:

$GHG_{FF\_TREE,t}$	=	Emission of non-CO_2 GHGs resulting from the loss of aboveground biomass of trees due to forest fire, in year *t*; tCO_2-e
$A_{BURN,i,t}$	=	Area burnt in stratum *i* in year *t*; ha

[46] For Equation 7 the numbering adopted in the methodological tool "*Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity" version 04.0.0*. was maintained.

b_{TREE,i,t_L}	=	Mean aboveground tree biomass per hectare in stratum *i* in year *tL* which is the year in which last verification was carried out before occurrence of the fire; t d.m. ha^{-1} Where aboveground biomass of living trees is not burnt by fire, b_{TREE,i,t_L} may be set equal to zero
$COMF_i$	=	Combustion factor for stratum *i*; dimensionless
$EF_{CH4,i}$	=	Emission factor for CH_4 in stratum *i*; g CH_4 (kg dry matter burnt)$^{-1}$
GWP_{CH4}	=	Global warming potential for CH_4; dimensionless
$EF_{N2O,i}$	=	Emission factor for N_2O in stratum *i*; g N_2O (kg dry matter burnt)$^{-1}$
GWP_{N2O}	=	Global warming potential for N_2O; dimensionless
I	=	1, 2, 3 … *M* strata
T	=	1, 2, 3, . years elapsed since the start of the project activity

4.3 Leakage

According to the methodology, leakage from project activity refer to the displacement, to other areas, of agricultural activities that already existed in the project area before the project. For the calculation of leakage, the "*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity*" methodological tool will be used, in its latest version.

$$LK_t = LK_{AGRIC,t}$$

Equation 4[47]

where

LK_t	=	GHG emissions due to leakage in year *t*; t CO_2-e

[47] For Equation 4 the numbering adopted in the *AR-ACM0003* methodology was maintained.

$LK_{AGRIC,t}$ = Leakage due to displacement of agricultural activities in year *t*, as estimated in the tool "*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity*"; t CO_2-e

As set out in section 1.11, one of the eligibility criteria for instances is the assessment of the area proposed for the project in order to determine whether there has been/will be a shift from agricultural activity to a new area.

If the instance does not cause emissions due to leakage, according to provisions of the methodological tool "*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity*" version 02.0, then GHG emissions due to leakage can be considered as zero:

$LK_t = 0$

If the area meets the criteria for the calculation of leakage emissions due to activity displacement, the following equations should be applied:

$$LK_{AGRIC,t} = \frac{44}{12} \times (\Delta C_{BIOMASS,t} + \Delta SOC_{LUC,t})$$ Equation 1[48]

$$\Delta C_{BIOMASS,t} = [1,1 \times b_{TREE} \times (1 + R_{TREE}) + b_{SHRUB} \times (1 + R_S)] \times CF \times A_{DISP,t}$$ Equation 2

$$\Delta SOC_{LUC,t} = SOC_{REF} \times (f_{LUP} \times f_{MGP} \times f_{INP} - f_{LUD} \times f_{MGD} \times f_{IND}) \times A_{DISP,t}$$ Equation 3

Where:

$\Delta C_{BIOMASS,t}$ = Decrease in carbon stock in the carbon pools of the land receiving the activity displaced in year *t*; t d.m.

Note: the factor of 1.1 is used to account for the carbon stock in dead wood and litter pools as a fixed percentage of the carbon stock in living trees.

[48] For Equations 1, 2 and 3, we have kept the numbering adopted in the "*Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity*" methodological tool.

CF = Carbon fraction of woody biomass; dimensionless

A default value of 0.47 is used unless transparent and verifiable information can be provided to justify a different value.

$A_{DISP,t}$ = Area of land from which agricultural activity is being displaced in year *t*; ha

b_{TREE} = Mean above-ground tree biomass in land receiving the displaced activity; t d.m. ha^{-1}

R_{TREE} = Root-shoot ratio for trees in the land receiving the displaced activity; dimensionless

A default value of 0.25 is used unless transparent and verifiable information can be provided to justify a different value.

b_{SHRUB} = Mean above-ground shrub biomass in land receiving the displaced activity; t d.m. ha^{-1}

The value of this parameter is obtained by applying one of the applicable methods from the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" to the land receiving the displaced activity.

R_S = Root-shoot ratio for shrubs in the land receiving the displaced activity; dimensionless

A default value of 0.40 is used unless transparent and verifiable information can be provided to justify a different value.

$\Delta SOC_{LUC,t}$ = Change in soil organic carbon (SOC) stock due to land-use change in the land receiving the displaced activity in year *t*; tC ha^{-1}.

The value of this parameter may be set to zero if:

(a) The only displaced activity being received in the land is grazing activity; or

(b) The value of the parameter as estimated from Equation (3) is less than zero (i.e. negative). Change in the organic carbon stock in the soil due to change in the land use of the site that will receive the relocated activity in the year *t*; t C ha^{-1}

SOC_{REF}	=	SOC stock corresponding to the reference condition in native lands by climate region and soil type applicable to the land receiving the displaced activity; t C ha^{-1}. The value of this parameter is taken from Table 3 of the "*Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities*"
$f_{LUP}, f_{MGP}, f_{INP}$	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land before the displaced activity is received; dimensionless. The value of these parameters is taken from Tables 4, 5, and 6 of the "*Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities*"
$f_{LUD}, f_{MGD}, f_{IND}$	=	Relative SOC stock change factors for land-use, management practices, and inputs respectively, applicable to the receiving land after the displaced activity has been received; dimensionless. The value of these parameters is taken from Tables 4, 5, and 6 of the "*Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities*".
t	=	1, 2, 3,... years elapsed since the start of the ARR project activity.

4.4 Net GHG Emission Reductions and Removals

In order to determine the removals attributable to the project, the guidance provided by the *AR-ACM0003* methodology was considered. Net anthropogenic GHG removals by carbon pools are calculated through the equation:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Equation 5[49]

Where:

[49] For Equation 5. the numbering adopted in the *AR-ACM0003* methodology was maintained.

$\Delta C_{AR-CDM,t}$	=	Net anthropogenic GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks, in year *t*; t CO_2-e
LK_t	=	GHG emissions due to leakage in year *t*; t CO_2-e

Table 9. Estimated GHG removals for the project lifetime.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2021	0	420,321.10	0	420,321.10
2022	0	1,527,173.25	0	1,527,173.25
2023	0	3,362,910.09	0	3,362,910.09
2024	0	5,505,885.82	0	5,505,885.82
2025	0	7,494,736.62	0	7,494,736.62
2026	0	9,061,707.60	0	9,061,707.60
2027	0	10,146,096.19	0	10,146,096.19
2028	0	4,451,552.11	0	4,451,552.11
2029	0	3,404,623.96	0	3,404,623.96
2030	0	3,362,910.09	0	3,362,910.09
2031	0	5,505,885.82	0	5,505,885.82
2032	0	7,494,736.62	0	7,494,736.62
2033	0	9,061,707.60	0	9,061,707.60
2034	0	10,146,096.19	0	10,146,096.19
2035	0	4,451,552.11	0	4,451,552.11
2036	0	3,404,623.96	0	3,404,623.96

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2037	0	3,362,910.09	0	3,362,910.09
2038	0	5,505,885.82	0	5,505,885.82
2039	0	7,494,736.62	0	7,494,736.62
2040	0	9,061,707.60	0	9,061,707.60
2041	0	10,146,096.19	0	10,146,096.19
2042	0	4,451,552.11	0	4,451,552.11
2043	0	3,404,623.96	0	3,404,623.96
2044	0	3,362,910.09	0	3,362,910.09
2045	0	5,505,885.82	0	5,505,885.82
2046	0	7,494,736.62	0	7,494,736.62
2047	0	9,061,707.60	0	9,061,707.60
2048	0	10,146,096.19	0	10,146,096.19
2049	0	4,451,552.11	0	4,451,552.11
2050	0	3,404,623.96	0	3,404,623.96
2051	0	3,362,910.09	0	3,362,910.09
Total				**4,203,026.55**

Note: This ex ante corresponds to the expected total GHG benefit for the project scenario (LTA), with a buffer discount of 24%, the baseline emission discount related to the pre-existing trees and a rating discount of 3%.

To calculate the average of carbon stock of the project scenario, the Long-Term Average was considered to the instance where wood will be harvested, according to "VCS Standard" guidelines. The Long-Term average was calculated by observing the following:

- The total period covered by the project was defined based on a number of complete cutting cycles, which included the minimum period of 30 years stipulated by the VCS for AFOLU projects (For the first instance, a period of 30 years was considered);

- The expected total GHG benefit of the project for each year of the established time period was determined (section 4.4.1).

- The total GHG benefit of each year during the established time period was summed, and divided by the total number of years considered to the project scenario, as follows:

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

Equation item 3.2.25[50]

Where:

LA	=	Long Term Average GHG benefit
PE_t	=	The total to-date GHG emission reductions and removals generated in the project scenario (tCO_2e). Project scenario emission reductions and removals shall also consider project emissions of CO_2, N_2O, CH_4 and leakage.
BE_t	=	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 established time period

A project may seek GHG credits during each verification event until the long-term average GHG benefit is reached. Once the total number of GHG credits issued has reached this average, the project can no longer issue further GHG credits. The long-term average GHG benefit shall be calculated at each verification event, meaning the long-term average GHG benefit may change over time based on monitored data.

Buffer

A calculation was carried out regarding the non-permanence risk of the project, which should be used to determine the number of buffer credits that an AFOLU project shall deposit into the AFOLU pooled buffer account. This procedure was carried out following the guidelines of the “AFOLU Non-permanence risk tool”, version 4.0, and the value obtained was deducted from the total value of estimated credits for the project scenario. The discounted amount was 24%.

[50] VCS Standard, version 4.4.

4.4.1 Ex ante calculation

The following is an example of how ex ante estimates will be generated for each instance. The first example refers to the first 50 farms planted with eucalyptus species.

For *Eucalyptus spp.* simulation, the area considered is the first instance's 32,226.25 hectares, in which pre-project land use was non-forestry activities, that is, agriculture and pasture.

Actual net GHG removals by sinks

As presented in section 4.2, actual net removals are calculated from the equation:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t}$$

Where:

$\Delta C_{ACTUAL,t}$	=	Actual net removals by sinks in year *t*; t CO_2-e
$\Delta C_{P,t}$	=	Change in the carbon stocks in the project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$GHG_{E,t}$	=	Increase in non-CO_2 GHG emissions within the project boundary as a result of the implementation of the A/R CDM project activity, in year *t*, as estimated in the tool "Estimation of non-CO_2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity"; t CO_2-e

According to section 1.11, the PP does not use fire as a clearing technique in the first instance ($GHG_{SPF,t}$ and $GHG_{FMF,t}$). Thus, only the third option, forest fires $GHG_{FF,t}$, can occur, which are usually accidental and not part of the usual management practices.

Non-CO_2 GHG emissions within the project boundary will be monitored as per the description in Section 5.2. For the purposes of exemplifying actual net removals, it is considered that no accidental fires have taken place, and therefore:

$GHG_{E,t} = 0$

Thus, actual net removals from the project will be:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$

Where:

$\Delta C_{P,t}$	=	Change in the carbon stocks in project, occurring in the selected carbon pools, in year *t*; t CO_2-e
$\Delta C_{TREE\_PROJ,t}$	=	Change in carbon stock in tree biomass in project in year t, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e
$\Delta C_{SHRUB\_PROJ,t}$	=	Change in carbon stock in shrub biomass in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e
$\Delta C_{DW\_PROJ,t}$	=	Change in carbon stock in dead wood in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e
$\Delta C_{LI\_PROJ,t}$	=	Change in carbon stock in litter in project in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e
$\Delta SOC_{AL,t}$	=	Change in carbon stock in SOC in project, in year *t*, in areas of land meeting the applicability conditions of the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities", as estimated in the same tool; t CO_2-e

According to the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2, it is conservatively considered that there are no shrubs in the project area, so shrub carbon stocks will be considered as zero. The example also assumes that project activity will not compute dead wood biomass, litter biomass and soil organic carbon. In this case, the parameters related to these carbon pools also will be considered as zero. Thus,

$\Delta C_{SHRUB\_PROJ,t} = 0$

$\Delta C_{DW\_PROJ,t} = 0$

$\Delta C_{LI\_PROJ,t} = 0$

$\Delta SOC_{AL,t}$ = 0

Therefore, actual net removals from the project are estimated based on the change in carbon stock in the biomass of trees. The first step is to estimate above-ground tree biomass in the first instances.

Trees (ΔC_{TREE})

To estimate the carbon stock in tree biomass at a point of time, the following tool was used: "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" Version 4.1. According to section 8.2 of this tool, the ex ante may be calculated by taking into account local tree-growth data from past experience (e.g. age-diameter curves, yield tables, yield curves) while also considering relevant site factors (e.g. soil, terrain, slope, aspect, precipitation) and stand parameters.

Considering this, average annual increment data and volume of past experiences in other areas similar to the areas of the project were used (Table 10). The density used for the calculations was also obtained from the project proponent's database, for the same eucalyptus species that will be planted in the project areas (Table 11).

Table 10. Average productivity curve

Age	Volume (m^3/ha)	AAI (m^3/ha/year)
1	18	17.8
2	58	29.2
3	117	38.9
4	175	43.8
5	222	44.4
6	255	42.5
7	276	39.4

Table 11. Wood density

Clones	Wood density (kg/m^3)
E50	448
E13	457
E142	528
E17	493
E137	505

E141	502
E150	500
ELD001	437
ELD008	504
ELD002	457
ELD004	469
ELD005	434
ELD006	464
ELD007	523
E41	492
E139	512
E140	487
E146	485
E148	524
E149	480

To calculate the above and below-ground biomass we used the equation 3.2.5 of the IPCC "Good Practice Guidance for Land Use, Land-Use Change and Forestry" where G_{TOTAL} is the expansion of annual increment rate of above-ground biomass (G_W) to include its below ground part, involving multiplication by the ratio of below-ground biomass to above-ground biomass (often called the root-to-shoot ratio (R)) that applies to increments. In case G_W data are not available, the increment in volume can be used with biomass expansion factor for conversion of annual net increment to aboveground biomass increment, as shown in equation 3.2.5:

EQUATION 3.2.5
AVERAGE ANNUAL INCREMENT IN BIOMASS

$$G_{total} = G_w \times (1 + R)$$ (A) In case aboveground biomass increment (dry matter) data are used directly. Otherwise G_W is estimated using equation B or its equivalent

$$G_W = I_V \times D \times BEF_1$$ (B) In case net volume increment data are used to estimate G_W.

Where:

G_{TOTAL} = average annual biomass increment above and below-ground, tons d.m. $ha^{-1}\ yr^{-1}$

G_W = average annual aboveground biomass increment, ton $ha^{-1}\ yr^{-1}$

R = root-to-shoot ratio appropriate to increments, dimensionless

I_V = average annual net increment in volume suitable for industrial processing, $m^3 \, ha^{-1} \, yr^{-1}$

D = basic wood density, tons d.m. m^{-3}

BEF_1 = biomass expansion factor for conversion of annual net increment (including bark) to aboveground tree biomass increment, dimensionless

Parameter	Value	Source
Average Annual Increment of wood in volume	Table 10	Project's Proponent database
Wood Density	0.485 (Average values of table 11)	Project's Proponent database
Biomass Expansion Factor, BEF	1.15	Methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs A/R CDM project activities"
Root-shoot ratio, R	0.25	Calculated according to Methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs A/R CDM project activities"

For the example, the age of 1 year was used, as it is the first year of planting. In the first year, an area of approximately 19,641.42 ha was planted, thus:

$$V_{total} = 17.8 \times 19{,}641.42 = \mathbf{349{,}617.28} \; m^3$$

$$G_{TOTAL} = 349{,}617.28 \times 0.485 \times 1.15 \times (1 + 0.25) = \mathbf{243{,}748.80} \; t \; ha^{-1} \; ano^{-1}$$

Subsequently, the carbon stock was calculated within the tree biomass estimation strata, according to the equation 12 of the AR-TOOL14:

$$C_{TREE} = \frac{44}{12} \times CF_{TREE} \times B_{TREE}$$

Where:

C_{TREE}	=	Carbon stock in trees in the tree biomass estimation strata; t CO_2e
CF_{TREE}	=	Carbon fraction of tree biomass; t C (t d.m.)$^{-1}$
B_{TREE}	=	Tree biomass in the tree biomass estimation strata; t d.m.

Thus, for the first year:

C_{TREE}	=	420,321.10

The same procedure was performed for the 31 years of the project, and then the Long-Term Average was applied to obtain the total carbon stock that will be removed from the atmosphere in the project scenario, as explained in section 4.4. The total value obtained for the project scenario after applying the Long-Term Average was 5,774,853.36 t CO_2e:

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
2021	0	420,321.10	0	420,321.10
2022	0	1,527,173.25	0	1,527,173.25
2023	0	3,362,910.09	0	3,362,910.09
2024	0	5,505,885.82	0	5,505,885.82
2025	0	7,494,736.62	0	7,494,736.62

2026	0	9,061,707.60	0	9,061,707.60
2027	0	10,146,096.19	0	10,146,096.19
2028	0	4,451,552.11	0	4,451,552.11
2029	0	3,404,623.96	0	3,404,623.96
2030	0	3,362,910.09	0	3,362,910.09
2031	0	5,505,885.82	0	5,505,885.82
2032	0	7,494,736.62	0	7,494,736.62
2033	0	9,061,707.60	0	9,061,707.60
2034	0	10,146,096.19	0	10,146,096.19
2035	0	4,451,552.11	0	4,451,552.11
2036	0	3,404,623.96	0	3,404,623.96
2037	0	3,362,910.09	0	3,362,910.09
2038	0	5,505,885.82	0	5,505,885.82
2039	0	7,494,736.62	0	7,494,736.62
2040	0	9,061,707.60	0	9,061,707.60
2041	0	10,146,096.19	0	10,146,096.19
2042	0	4,451,552.11	0	4,451,552.11
2043	0	3,404,623.96	0	3,404,623.96
2044	0	3,362,910.09	0	3,362,910.09
2045	0	5,505,885.82	0	5,505,885.82
2046	0	7,494,736.62	0	7,494,736.62
2047	0	9,061,707.60	0	9,061,707.60
2048	0	10,146,096.19	0	10,146,096.19
2049	0	4,451,552.11	0	4,451,552.11
2050	0	3,404,623.96	0	3,404,623.96
2051	0	3,362,910.09	0	3,362,910.09
Total				5,774,853.36

Note: Average carbon stock = 179.20 CO_2e/ha; Average annual carbon increment per hectare/year = 51.2 CO_2e/ha/year.

With the value of tree carbon stock in the first instances, the change in carbon stock in the project scenario will be:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t}$$

Where:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + 0 + 0 + 0 + 0$$

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} = C_{TREE} = 5{,}774{,}853.36 \text{ tCO}_2\text{e}$$

Finally, actual net removals will be:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} = 5{,}774{,}853.36 - 0 = 5{,}774{,}853.36 \text{ tCO}_2\text{e}$$

Baseline net GHG removals by sinks

According to section 5.4 of the methodology AR-ACM003 the baseline net GHG removals by sinks shall be calculated as follows:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t}$$

Where:

$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{TREE\_BSL,t}$	=	Change in carbon stock in baseline tree biomass within the project boundary in year *t*, as estimated in the tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”; t CO_2-e

$\Delta C_{SHRUB\_BSL,t}$ = Change in carbon stock in baseline shrub biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t CO_2-e

$\Delta C_{DW\_BSL,t}$ = Change in carbon stock in baseline dead wood biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

$\Delta C_{LI\_BSL,t}$ = Change in carbon stock in baseline litter biomass within the project boundary, in year *t*, as estimated in the tool "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities"; t CO_2-e

Pre-existing Trees ($\Delta C_{TREE\_BSL,t}$)

For the first instances some pre-existing trees were removed and their volume was calculated through measurement of sample plots (option 1 of section 4.1.1.1). Sample plots of 1000 m² were allocated according to the methodological tool "*Calculation of the number of sample plots for measurements within A/R CDM project activities*", and DBH and height data were collected in all sample plots. The operational procedures, as well as data regarding height and DBH of removed trees will be presented to the VVB during validation.

To calculate the volume removed from pre-existing trees, the cylinder volume formula was used and multiplied by the form–factor:

$$Vcylinder = \left(\pi * \frac{DBH}{40000}\right) * HT * f$$

Where:

$V_{cylinder}$ = Cylinder volume (m³)

П = 3.14

DBH = Diameter at breast height (cm)

HT = Tree height (m)

f	=	Form-factor; A form factor of 0.7 was adopted for the analyzed Cerrado phytophysiognomies due to the recommendations of values ranging from 0.65 to 0.70, according to RADAMBRASIL in 1985.

To calculate the biomass removed from pre-existing trees in baseline, equation 5 of the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" was used:

$$B_{TREE,l,j,p,i} = V_{TREE,j}\left(x_{1,l}, x_{2,l}, x_{3,l}, \ldots\right) \times D_j \times BEF_{2,j} \times \left(1 + R_j\right)$$

Where:

$B_{TREE,l,j,p,i}$	=	Biomass of tree l of species j in sample plot p of stratum i; t d.m.
$V_{TREE,j}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots)$	=	Stem volume of tree *l* of species *j* in sample plot p of stratum *i*, estimated from the tree dimension(s) as entry data into a volume table or volume equation; m^3
D_j	=	Density (over-bark) of tree species *j*; t d.m. m^{-3}
$BEF_{2,j}$	=	Biomass expansion factor for conversion of tree stem biomass to above-ground tree biomass, for tree species j; dimensionless
R_j	=	Root-shoot ratio for tree species j; dimensionless

The source of data and parameters used to calculate the volume of pre-existing trees that were removed are presented in the table 12:

Table 12. Source of data and parameters used to calculate the volume of pre-existing trees.

Parameter	Value	Source
Volume	Table 13	Calculated through sampling (The procedures for calculating the number of sample plots, allocating the sample plots and calculating the volume removed from pre-existing trees will be demonstrated to VVB in the validation).
Wood Density	0.8169	Good Practice Guidance for Land Use, Land-Use change and Forestry, 2003.
Biomass Expansion Factor, BEF	1.15	Methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs A/R CDM project activities”
Root-shoot ratio, R	0.34	Calculated according to Methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs A/R CDM project activities

The volume of trees, biomass and CO_2e per farm and total that were removed is presented in table 13.

Table 13. Volume, Biomass and CO_2e removed from the baseline

Farm	Volume (m^3)	Biomass (AGB + BGB) (t.d.m)	CO_2e (t)
Campo Limpo I	1,075.72	1354.16	2333.67
Recanto-Minervino	456.80	575.04	990.98
São Mateus Rezek	350.11	440.73	759.53
Santa Rita de Cássia	303.38	381.91	658.15
Vale da Pecuária	14.22	17.90	30.85
Cel. Cacildo Arantes	2,227.12	2803.59	4831.53
Santa Olga II	696.50	876.78	1510.99
Santa Edwirges	1,492.60	1878.95	3238.06
Caçula I e II	1,138.78	1433.55	2470.48
Da Mata	1,035.43	1303.44	2246.27
São Francisco-Francisco Queiroz	1,250.79	1574.55	2713.47
Divisa-Onofre	380.46	478.94	825.37
São Jorge-Jorge Elias	2,003.00	2521.46	4345.32
Varjãozinho	957.86	1205.80	2077.99

Farm	Volume (m^3)	Biomass (AGB + BGB) (t.d.m)	CO_2e (t)
Aliança	575.31	724.22	1248.08
Nova Monte Alto	321.65	404.91	697.79
Padroeira	266.51	335.49	578.17
Paraiso do Queixada	137.44	173.02	298.16
Marca Quatro	3,158.87	3976.52	6852.87
Barra Dourada	1,679.55	2114.29	3643.63
Signo Sol	135.77	170.91	294.54
São Luiz-Antenor (Santa Rosa)	212.16	267.08	460.26
São Benedito II	163.10	205.32	353.83
Boa Vista-Aires	1,691.11	2128.84	3668.70
Santa Irene-Alvarez	342.88	431.63	743.85
Estiva I	24.81	31.23	53.82
Idalina	423.61	533.26	918.98
Nossa Senhora Fatima-Alvarez	250.74	315.64	543.96
Vanemar	317.37	399.52	688.50
1º Maio	286.04	360.08	620.54
1º Julho	135.51	170.59	293.98
Santa Luzia-Coletti	470.33	592.07	1020.34
São Vitor	549.50	691.73	1192.09
Nossa Senhora Fatima-Claudio Franco	1,330.73	1675.18	2886.89
Jacuba	1,880.40	2367.13	4079.35
Vó Neuza	484.06	609.36	1050.12
Nossa Senhora da Penha	854.97	1076.27	1854.78
São José Gleba II	59.12	74.42	128.26
Alba	433.93	546.25	941.37
Santa Vera	908.30	1143.41	1970.47
São Martinho	187.37	235.87	406.48
Rio Preto	113.39	142.74	245.99
Conquista II	545.85	687.14	1184.17
Rancho Pecora	942.23	1186.12	2044.08
Conquista-Coletti	258.94	325.96	561.75
Três Irmãos	132.41	166.68	287.25
São José	459.85	578.88	997.60
Santa Therezinha	133.94	168.61	290.57
Raimundo Bezerra	344.31	433.43	746.95
Beija-Flor	292.38	368.06	634.29
Total	33,887.21	42,658.67	73,515.11

Thus:

$\Delta C_{BSL,t}$ = 73,515.11 t CO_2e

Trees that have not been removed and still remain in the project areas will have their survival monitored, by the following method:

Drone images with a spatial resolution of 10 cm will be used, and the remaining tree individuals in the area will be counted (Census). This drone flight is carried out after planting to identify the remaining individuals and will be carried out again in the years of verification of the project for issuing credits. Subsequently, if any individual dies, the DBH and height of a number of trees statistically representative of the remaining population will be measured (Stratified random sampling, according to option 1 of the section 4.1.1.1, guided by the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities") and the average individual volume (AIV) obtained will be multiplied by the number of trees that was lost. Subsequently, the volume will be transformed into biomass and carbon, as instructed in equation 5 of the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities.

Shrubs, Dead Wood and Litter

As described in Section 4.1.1.2, for the first instance the project activity will not consider carbon removals from the pool shrubs, as the previous land use is determined as non-forested land, notably agriculture or pasture. So, condition "f" applies to the instance and the carbon stocks and change in carbon stocks in shrubs in the baseline could be accounted as zero. The pools dead wood and litter also were considered as zero. Therefore, these pools in the baseline may be considered as zero:

$\Delta C_{SHRUB\_BSL,t} = 0$

$\Delta C_{DW\_BSL,t} = 0$

$\Delta C_{LI\_BSL,t} = 0$

GHG emissions due to leakage

To assess the leakage, the PP prepared a questionnaire that was applied during the due diligence to identify whether agricultural activities had been displaced as a result of the project. No displacement of activities that generated GHG emissions to another area was identified. Thus, as stated in section 4.3, leakage for the first instance is considered to be zero:

LK_t = 0

The evidences will be submitted to the VVB during validation.

Net anthropogenic GHG removals by sinks

Net anthropogenic GHG removals by sinks are calculated using the equation:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

Where:

$\Delta C_{AR-CDM,t}$	=	Net anthropogenic GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{ACTUAL,t}$	=	Actual net GHG removals by sinks in year *t*; t CO_2-e
$\Delta C_{BSL,t}$	=	Baseline net GHG removals by sinks in year *t*; t CO_2-e
LK_t	=	GHG emissions due to leakage in year *t*; t CO_2-e

Considering the results presented in the ex ante simulation above:

$$\Delta C_{AR-CDM,t} = \Delta C_{ACTUAL,t} - \Delta C_{BSL,t} - LK_t$$

$\Delta C_{AR-CDM,t}$ = **5,774,853.36** – 73,515.11 – 0 = 5,701,338.24 tCO_2e

With buffer discount (24%):

$\Delta C_{AR-CDM,t}$ = 4,333,017.06 tCO_2e

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	CF_{TREE}
Data unit	t C (t d.m.)$^{-1}$
Description	Carbon fraction in of tree biomass
Source of data	Default value of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2
Value applied	0.47
Justification of choice of data or description of measurement methods and procedures applied	The default value from the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2 is used
Purpose of Data	Calculation of net baseline removals and Calculation of actual net removals
Comments	N/A

Data / Parameter	$COMF_i$
Data unit	Dimensionless
Description	Combustion factor for stratum *i*
Source of data	Default value of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0

Value applied	Age Range / Default Value 3 - 5 years 0.46 6 -10 years 0.67 11 - 17 years 0.50 18 and above 0.32
Justification of choice of data or description of measurement methods and procedures applied	The default value of the methodological tool "Tropical Forest" of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0 is used
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	$EF_{CH4,i}$
Data unit	g kg^{-1} burnt dry matter
Description	CH_4 emission factor in stratum i
Source of data	Default value of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0
Value applied	6.8
Justification of choice of data or description of measurement methods and procedures applied	The default value for "Tropical Forest" of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0 is used
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	GWP_{CH4}

Data unit	Dimensionless
Description	Global warming potential for CH_4
Source of data	VCS Standard v.4.4 Table 2 (IPCC - *Fourth Assessment Report)*
Value applied	28
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	$EF_{N2O,i}$
Data unit	g kg^{-1} burnt dry matter
Description	Emission factor for N_2O in stratum *i*
Source of data	Default value of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0
Value applied	0.2
Justification of choice of data or description of measurement methods and procedures applied	The default value for "Tropical Forest" of the methodological tool "*Estimation of non-CO2 GHG emissions resulting from burning of biomass attributable to an A/R CDM project activity*" version 04.0.0 is used
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	GWP_{N2O}

Data unit	Dimensionless
Description	Global warming potential for N_2O
Source of data	VCS Standard v.4.4 Table 2 (IPCC - *Fourth Assessment Report)*
Value applied	265
Justification of choice of data or description of measurement methods and procedures applied	Default value
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	$V_{TREE,j}(x_{1,l}, x_{2,l}, x_{3,l}, \ldots)$
Data unit	m^3
Description	Stem volume of tree l of species j in the baseline, estimated from the tree dimension(s) as entry data into a volume table or volume equation; m^3
Source of data	$Vcylinder = \left(\pi * \frac{DBH}{40000}\right) * HT * f$ A form factor of 0.7 was adopted for the analyzed Cerrado phytophysiognomies due to the recommendations of values ranging from 0.65 to 0.70, according to RADAMBRASIL in 1985.
Value applied	$Vcylinder = \left(\pi * \frac{DBH}{40000}\right) * HT * f$ The final values are shown in table XXXXX.
Justification of choice of data or description of measurement methods and procedures applied	A forest inventory of pre-existing trees was carried out using the sampling method to obtain the volume of trees removed in the clearing of the area. All operational procedures used will be demonstrated in the validation.

Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	R_j
Data unit	Dimensionless
Description	Root-shoot ratio for stratum i
Source of data	Calculated according to the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2
Value applied	$R_j = \frac{e^{(-1.085+0.9256\times\ln b)}}{b}$ Where: b = above-ground biomass per hectare (t d.m. ha-1)
Justification of choice of data or description of measurement methods and procedures applied	Equation used in ex ante and ex-post estimates. Standard calculation of the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" version 04.2
Purpose of Data	Calculation of actual net removals
Comments	N/A

Data / Parameter	$\mathbf{BEF_{2,j}}$
Data unit	Dimensionless
Description	Biomass expansion factor for conversion of stem biomass to aboveground biomass for tree species j
Source of data	Values from the methodological tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs" are used unless transparent and verifiable information can be provided to justify different values.

Value applied	*1.15*
Justification of choice of data or description of measurement methods and procedures applied	The default value from the methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs *in A/R CDM project activities*”.
Purpose of Data	Calculation of baseline emissions and actual net removals.
Comments	N/A

Data / Parameter	D_J
Data unit	*t.d.m. m^{-3}*
Description	Basic wood density for species *j*
Source of data	*Values from Table 3A.1.9 of IPCC GPG-LULUCF 2003 are used unless transparent and verifiable information can be provided to justify different values*
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	The default value from the methodological tool “Estimation of carbon stocks and change in carbon stocks of trees and shrubs *in A/R CDM project activities*”.
Purpose of Data	Calculation of baseline emissions and actual net removals
Comments	N/A

5.2 Data and Parameters Monitored

Data / Parameter	A_i
Data unit	Hectares (ha)

Description	The area of stratum i of the areas of land
Source of data	GPS and/or GIS
Description of measurement methods and procedures to be applied	The project's planting areas will be delimited via GPS or GIS. Measurement in the field is made with GPS in APP areas and in the productive area, followed by drone flights. In the office, the field information is used for demarcation on the cartographic base. After planting a further flight is made to analyze whether the whole area made available has been planted and whether the full limit has been obeyed. Adjusting the cartographic base, ensuring precision and avoiding errors of areas.
Frequency of monitoring/recording	Every verification period
Value applied	[to be completed by the instance at each check]
Monitoring equipment	GPS and/or GIS
QA/QC procedures to be applied	Refer to IPCC 2003 2.4.4.2 "Ground-based surveys". Field teams will be formed by PP's own team or outsourced. The team members will have appropriate qualification to perform the activity and correct use of the equipment and will act in accordance with the best practices for area measurement. GPS instruments used are free of error and as per the manufacturer's specifications.
Purpose of data	Calculation of actual net removals
Calculation method	N/A
Comments	N/A

Data / Parameter	n_i
Data unit	Dimensionless
Description	Number of sample plots in stratum *i*

Source of data	Calculated
Description of measurement methods and procedures to be applied	The calculation method is described in the tool "*Calculation of the number of sample plots for measurements within A/R CDM project activities*" (version 02.1.0)
Frequency of monitoring/recording	Every verification period
Value applied	[to be completed by the instance at each check]
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Calculation of actual net removals
Calculation method	N/A
Comments	N/A

Data / Parameter	$A_{PLOT,i}$
Data unit	Ha
Description	Size of sample plot in stratum *i*
Source of data	Measured/calculated
Description of measurement methods and procedures to be applied	The sample plots will be located in the field with the help of GPS. The sample plots will have circular, quadrangular or rectangle format, with a range of approximately 0.03 to 0.06 ha in the case of planted forests and 0.1 ha in restoration areas. The sample plots will be allocated in the field systematically with a random start point.
Frequency of monitoring/recording	Every verification period
Value applied	[to be completed by the instance at each check]

Monitoring equipment	GPS and/or GIS
QA/QC procedures to be applied	Planted forests: Follow guidelines provided in the forestry inventory standard operational procedure. Restoration: Follow guidelines provided in the general procedure for the implementation of the instances. These SOPs were made available to the VVB during validation
Purpose of data	Calculation of actual net removals
Calculation method	N/A
Comments	N/A

Data / Parameter	DBH
Data unit	Cm
Description	Diameter at breast height
Source of data	Measurement
Description of measurement methods and procedures to be applied	The measurement of circumference at breast height (CBH) is made at 1.30m from the soil and must follow the forest inventory procedures in accordance with best measurement practices. Subsequently, the CBH is transformed into DBH (Diameter at breast height) by multiplying by the value of pi (3.14). The measurement of the circumference at breast height/diameter at breast height is made at 1.30 m from the ground and must follow the forest inventory procedures according to the “Field Manual of the National Forestry Inventory of Brazil” published by the Ministry of the Environment (2020).
Frequency of monitoring/recording	Every verification period
Value applied	[to be completed by the instance at each check]
Monitoring equipment	Tape measure

QA/QC procedures to be applied	Planted forests: Follow guidelines provided in the forestry inventory standard operational procedure. These SOPs were made available to the VVB during validation
Purpose of data	Calculation of actual net removals
Calculation method	N/A
Comments	N/A

Data / Parameter	Ht
Data unit	Meters
Description	Total height of tree
Source of data	Measured/estimate
Description of measurement methods and procedures to be applied	Planted Trees: The total tree height in planted forests is measured with the help of height measurement equipment (for example, hypsometer, clinometer, laser sensor). At least four trees will be measured per sample plot (in general, the acceptable error in hypsometric equations is achieved measuring approximately 10 trees). Based on the correlation between the data for DBH and height measured, the heights of the other trees of the sample plot will be measured using a hypsometric equation. For visual estimation, height measurement will follow the provisions of the “Field Manual of the National Forestry Inventory of Brazil”, published by the Brazilian Ministry of the Environment (2020). Visual estimation may be conducted using, for example, a measuring pole, retractable pole or hypsometer. (i) measuring pole, retractable pole: the height is measured using the length of the pole positioned next to the tree as a reference. (ii) hypsometer: the hypsometer is used as a measuring equipment for as long as the team member can visualize the tree through it. From this point on, the rest of the tree height is measured using the height value obtained through the hypsometer as a reference.

Frequency of monitoring/recording	Every verification period
Value applied	[to be completed by the instance at each check]
Monitoring equipment	Height measurement equipment (for example: hypsometer, clinometer, laser sensor), if.
QA/QC procedures to be applied	Planted forests: Follow guidelines provided in the forestry inventory standard operational procedure. These SOPs were made available to the VVB during validation.
Purpose of data	Calculation of actual net removals
Calculation method	N/A
Comments	N/A

Data / Parameter	R_j
Data unit	*Dimensionless*
Description	Root-shoot ratio for stratum *i*
Source of data	Calculated according to the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2
Value applied	$R_j = \frac{e^{(-1.085+0.9256\times\ln b)}}{b}$ Where: b = above-ground biomass per hectare (t d.m. ha^{-1})
Justification of choice of data or description of measurement methods and procedures applied	Equation used in ex-post estimates. Standard calculation of the methodological tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*" version 04.2
Purpose of Data	Calculation of actual net removals

Comments	N/A

5.3 Monitoring Plan

Field data collection may be performed by a third-party company specialized in forest inventories. For the selection of the company, the PP will assess its technical capacity to carry out the work. The teams and data collected will be audited by the PP as specified in contract. Upon receipt of the data, the PP will check whether the data meets the parameters determined in the project. If so, the PP will be responsible for collecting, processing, and archiving the data for at least 2 years after the end of the project verification period using inventory system, databases or spreadsheets. Monitoring of the project activities will be planned and executed according to Section 6 of the tool "*Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities*", version 4.2, and data will be archived and kept for at least 2 years after the end of the project verification period.

As per the table below, the PP may conduct the instances' verifications in different periods according to the purpose of the forest and/or planting species. This may be done by grouping instances' according to their age range, optimizing resources.

Table 14: proper period for monitoring carbon stocks of forests

Year	Age (months)	Eucalyptus
1	0 to 12 months	-
2	12 to 24 months	-
3	24 to 36 months	X
4	36 to 48 months	X
5	48 to 60 months	X
6	60 to 72 months	X
7	72 to 84 months	Harvesting
8	0 to 12 months	-
9	12 to 24 months	-
10	24 to 36 months	X
11	36 to 48 months	X
12	48 to 60 months	X
13	60 to 72 months	X
14	72 to 84 months	Harvesting
15	0 to 12 months	-
16	12 to 24 months	-
17	24 to 36 months	x

Year	Age (months)	Eucalyptus
18	36 to 48 months	x
19	48 to 60 months	x
20	60 to 72 months	x
21	72 to 84 months	Harvesting
22	0 to 12 months	-
23	12 to 24 months	-
24	24 to 36 months	x
25	36 to 48 months	x
26	48 to 60 months	x
27	60 to 72 months	x
28	72 to 84 months	Harvesting
29	0 to 12 months	-
30	12 to 24 months	-
31	24 to 36 months	x

Collection of all relevant data, as per the methodology requirements

Applicability conditions:

(a) Previous land use: the PP will use satellite images 10-year prior and immediately previous to the project implementation, to ensure that the proposed project area was not occupied by native ecosystems in this period,

(b) The area of the project activity does not fall into the category of wetlands: The PP will verify through shapes and/or maps that the proposed project is not located in wetlands.

(c) Soil disturbance attributed to the proposed project activity do not cover more than 10% of the project area that:

i. Contain organic soils: the PP will verify through shapes and/or maps that the proposed project is not located in areas where organic soils occur.

ii. At the baseline are subject to land use management conditions which receive inputs listed in Appendices 1 and 2 of the AR-ACM003 methodology, version 02.0: if the land use at baseline falls within one of the conditions listed in Appendices 1 and 2 of the AR-ACM003 methodology, the PP will check if tillage do not disturb more than 10% of the project area, e.g. evaluation of the proportion of tilled area (width x length of the tilled line x number of tilled lines or dug area x number of pits) in relation to the total area of the project. In general, the PP adopts minimal cultivation, that is, it only performs the revolving of the soil in the planting line, resulting in very low impact on the soil cover.

(d) Forestation of the land within the proposed project boundary performed with or without being registered as the AFOLU project activity shall not lead to violation of any applicable law even if the law is not enforced: the PP will present all the necessary documentation for the implementation of the project to the relevant agencies of the Host Country.

(e) Not applicable to small-scale AFOLU project activities: no area within this grouped project will be considered small-scale projects.

Project boundary: The geographical coordinates of the project boundary and all stratifications will be recorded using GPS, satellite images and/or land use maps. The PP will designate a GIS expert to coordinate this activity together with a team or hire a specialized company.

Existing vegetation: according to the standard for eligible areas, pre-project/existing vegetation are sparse and scattered. In case they occur their survival will be monitored and those that are eventually removed will be accounted for as baseline emissions).

Leakage: according to the applied methodology, leakage refers to the displacement of agricultural activities. In order to identify and minimize potential leakage, the PP will prepare and apply a questionnaire to all potential instances regarding the situation of the land to be leased, the existence of any agricultural activity/ cattle and its possible displacement and destination.

All monitored will be kept and archived for at least two years after the end of the final crediting period.

<u>The organizational structure, responsibilities, and competencies of the grouped project's team</u>

Eldorado has the overall responsibility for all operational and management arrangements for the implementation of this grouped project. The PP must form a team to deal with project's matters and check that all new instances meet the eligibility criteria (as per section 1.4) for their inclusion in this grouped project. The team may hire consultants to support them in this task, as they deem necessary.

Some of the general competencies required from the grouped project's team members are as follows:

- Clear understanding of the goals and purpose of the grouped project;
- Know the eligibility criteria for inclusion of instances under the grouped project, that is, be able to access weather a proposed instance is eligible to be a part of the grouped project;
- Know the Monitoring Plan for the instances;
- Capacity to assess project related documents such as land documents, licenses and other to verify the qualification of the instance to be included under the grouped project;
- Capacity to analyze monitoring data and monitoring related documents;
- Capacity to interact with possible instance implementers and clearly communicate the grouped project's concept.

The PP should provide training and capacity-building activities for its staff, based on any identified needs, so as to ensure the continuous improvement of the grouped project management system. Records of staff development activities will be archived.

The PP will stimulate implementation of sustainable forestry activities within the limits of the grouped project.

The PP uses a management system that aims to ensure implementation and monitoring of all the instances in an effective and verifiable manner. The system described below includes the arrangements for operation and management to be established by the PP for the implementation of the project and inclusion of instances.

The PP will be responsible for the process of analysis of the eligibility criteria and inclusion of new instances and ensure that all the parties involved in the operation of the project are aware of and agree with its activities.

The PP's team is experienced in dealing with a wide range of forestry subjects, including (but not limited to) technical, legal, finance, and social environmental issues. The team involved in the grouped project will deal with the requirements of the project, and also specificities of the instances, so as to ensure complete monitoring of the data generated. The team will know the eligibility criteria for inclusion of an instance and the items of monitoring for implementation of the project.

The planned activities for the project's implementation are listed below. Each activity and other details are described in an operational procedure presented to the VVB during validation. This list and the activities are subject to improvements whenever necessary.

1) Contact with the partner
2) Preparation of preliminary maps
3) Map validation
4) Productive potential analysis
5) Area of interest analysis
6) Final analysis
7) Validation by partner
8) Approval by Forestry Director
9) Documentation analysis
10) Contract registration
11) Controller and legal validation
12) Environmental regularization of the area
13) Inclusion in the database and operational availability
14) Monitoring tree survival
15) Planted Area Survey - Post-planting (UAV Flight)
16) Amendment contract (if applicable)
17) Technical assistance
18) Field monitoring

19) Monitoring through image (checking)

20) Receipt of wood - Contact with partner and field visit

21) Harvesting

22) Contract closure.

To include a new instance under the grouped project the PP will carry out a technical evaluation of the properties. The team responsible will check the information supplied by the landowners against the requirements of the Eligibility Criteria (see section 1.4 above) to establish that the activity of the project is adequate and, if approved, a inclusion agreement will be designed, explicitly setting out the incentives and responsibilities, in accordance with the specificities of each property. The PP will then arrange all the documentation required for inclusion of the property as an instance.

The PP will notify any instance landowner who does not conform with the monitoring plan, nor provide all information requested, or whose information is considered insufficient. If the landowner is unable to supply all the information required, the PP will inform the landowner that his land cannot be included in the grouped project.

The PP reserves the right to remove from the grouped project any instance that does not comply with the provisions of the inclusion agreement.

To avoid double counting the PP will confirm if the instance is included in any other Program of Activities or already registered as a project activity in any mechanism.

In addition, the database presented below will ensure that all instances shall be uniquely defined, thereby avoiding double counting of the removals accounted.

The PP will develop and maintain a record and documentation control system (database) containing all the information on each instance under the VCS grouped project, including:

- Name and contact information of the landowner;
- Inclusion agreement between the landowner and the PP;
- Name/ ID of the instance;
- Start date of the instance;
- Geographical location of the instances (GPS coordinates);
- Project implementation areas (in hectares and maps)
- Crediting period;
- Start date and end of the crediting period;
- Verification status (history of verifications and monitoring periods);
- Historic removals monitored and issued in each monitoring period;
- Evidence for each eligibility criterion to demonstrate that the instance is in accordance with the eligibility criteria for inclusion in the grouped project;

- All the data and information collected during the monitoring periods related to the removals achieved by the instance.

As the PP is a certified company, all these will be included in the continuous improvement actions applied to all areas of Eldorado.

Sampling Plan

Strata identification in the proposed project activity follows the stratification guidelines mentioned in the *AR-ACM0003* methodology, both for baseline net GHG removals by sinks, and for actual net GHG removals by sinks:

- For baseline net GHG removals by sinks, stratification of the project area is done according to the type of vegetation existing at the site;
- For actual net GHG removals by sinks, the *ex ante* stratification of the project area is based on the expected year of implementation.

The project will adopt a simple sampling procedure.

Number of sample plots:

Initially, sample plots will be systematically installed every 10 ha, with a random start, in order to ensure uniform coverage of the area. Subsequently, based on the standard deviation, a minimum number of sample plots will be calculated in order to guarantee that biomass estimation error is not higher than +/- 10 per cent with a confidence level of 90 per cent. The number of sample plots required for the project (n) will be defined by the following equation (as per the *Calculation of the number of sample plots for measurements within A/R CDM project activities* tool):

$$n = \frac{N * t_{VAL}^{2} * \left(\sum_{i} w_i * s_i \right)^2}{N * E^2 + t_{VAL}^{2} * \sum_{i} w_i * s_i^{2}}$$

Equation 1[51]

where:

[51] For Equations 1 and 4, the numbering adopted in the methodological tool "*Calculation of the number of sample plots for measurements within A/R CDM project activities" version 02.1.0* was maintained.

n = Number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless

N = Total number of possible sample plots within the project boundary (i.e. sampling space or population); dimensionless

t_{VAL} = Two-sided Student's *t*-value, at infinite degrees of freedom with a 90 per cent confidence level; dimensionless

w_i = Relative weight of area of stratum *i* (that is, area of stratum *i* divided by project area); dimensionless

s_i = Estimated standard deviation of biomass stock in stratum *i*; t d.m. (or t d.m. ha^{-1})

E = Acceptable margin of error in estimation of biomass stock within the project boundary; t d.m. (or t d.m. ha^{-1}), that is, in the units used for s_i

i = 1,2,3,..... biomass stock estimation strata within the project boundary

The number of sample plots allocated to a stratum is calculated as

$$n_i = n * \frac{w_i * s_i}{\sum_i w_i * s_i}$$ Equation 4

where:

n_i = number of sample plots allocated to stratum *i*; dimensionless

n = number of sample plots required for estimation of biomass stocks within the project boundary; dimensionless

w_i = Relative weight of the area of stratum *i* (i.e. the area of the stratum *i* divided by the project area); dimensionless

s_i = Estimated standard deviation of biomass stock in stratum *i*; t d.m. (or t d.m. ha^{-1})

i = *1, 2, 3,* . biomass stock estimation strata within the project boundary

Internal quality control (QC) and quality assurance (QA) procedures will be applied in order to guarantee the highest possible standardization and accuracy of field data.

Sampling Project

Type of sample plot	Permanent and/or temporary sample plots
Sample plot shape	Circular and/or rectangular
Sample plot size	Approximately 300 m^2, but could be substantially larger in thinning areas
Number of sample plots	To be calculated according to forest variability using accepted formulas
Sample plot location	Sample plots will be systematically distributed, with a random start. Sample plot coordinates, location, number, and other registration information will be stored.
Monitoring frequency	Sample plots will be monitored for each crediting period.
Assessment of carbon stock changes over time	Changes will be estimated using an allometric equation based on DHB and Ht.
Monitoring of GHG emissions due to the project activity	Monitoring of accidental fires according to AR-TOOL 08 (section 4.2 Emission of non-CO_2 GHG resulting from burning of biomass)

Procedures for QA/QC

The PP will address any QA/QC procedures through its internal procedures based on commonly accepted principles and practices of forest inventory and forest management in the host country or an adaptation of SOPs available from published handbooks or scientific literature or from the "IPCC Good Practice

Guidance for Land Use, Land-Use Change and Forestry 2003", as per the methodology *AR-ACM0003 version 02.0* provisions.

(i) Reliability regarding field measurements/ data collection

Field team members will have appropriate training to carry out field measurements and the monitoring activities required and will act in accordance with the best practices for data collection. All training, whether internal or external, generates a record, e.g. attendance list.

Each team member is fully aware of the importance of collecting the data as accurately as possible and the impact that this activity can have on the final calculation of GHG removals from the atmosphere by the project.

(ii) Methods used to collect field data

Standard operational procedures are in place in order to guarantee quality of data collection, measurements and procedures. SOPs for all activities under this grouped project will be made available to the VVB during validation.

All standard operational procedures are subject to change/ continuous improvement throughout the implementation of the grouped project, provided they comply with the requirements within this PD.

(iii) Data maintenance and archiving

To increase accuracy of the monitoring data, quality assurance and quality control procedures are established following commonly accepted principles and practices of forest inventory and forest management in the host country i.e. NBR-Brazilian Technical Norm and FSC.

Monitored data required for verification and issuance are kept and archived for at least two years after the end of the final crediting period or the last issuance of VCUs, whichever occurs later.

(iv) Continuous improvement

The data accumulated in previous years will guide the continuous improvements in operations. Continuous process of observation, verifications, checks, comparations and analyses, aiming at identifying needs for corrections, improvements of procedures and their execution at all levels are to be carried out.