# Grouped Project Serra do Sudeste

The Green Branch

**Document Prepared by The Green Branch**

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| Project Title | Grouped Project Serra do Sudeste |
| Version | 1.0 |
| Date of Issue | 10.06.2022 |
| Project Location | Brazil, Rio Grande do Sul |
| Project Proponent(s) | The Green Branch B.V.<br>Kasper Kupperman<br>+31 6 13411853<br>k.kupperman@thegreenbranch.nl |
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| Project Lifetime | 09.10.2021 until 08.10.2056 |

| | |
|---|---|
| GHG Accounting Period | 09.10.2021 until 08.10.2056 (Per project instance at least 30 years carbon crediting within the project lifetime) |
| History of CCB Status | Not applicable |
| Gold Level Criteria | The grouped project fulfils Climate Gold Level criteria, as it describes different climate change scenarios for the project region, explains their impact on biodiversity and community and how the project supports resilience against climate change.<br><br>The Community Gold Level criteria are met. The project proponent puts landowners, farmers and the local community at the centre of the projects. Community groups are involved in the supply chain, planting operations, and monitoring. The operational team consists of local workers. The project develops their capacity for new skills and education, and improves the livelihoods of them and their families. By providing capital, access to a supply chain of biodiverse planting material, technical assistance and connecting them to the carbon market, we will change their perspective and give them the necessary tools to become true nature conservationists.<br><br>The Biodiversity Gold Level criteria are met. The Serra do Sudeste Grouped Project is an ARR activity that enhances the population status of threatened species. Specifically, during forestation activities some hundreds of Araucaria angustifolia seedlings will be planted. A. angustifolia is considered a Critically Endangered (CR) species according to the IUCN Red List of Threatened Species. By actively planting araucaria seedlings, project activities will enhance the species population, thus offering exceptional biodiversity benefits. In addition, 39 globally Critically Endangered (CR) and 58 globally Endangered (EN) species of flora can be found in the grouped project region and could potentially be benefitted from reduced threats as a result of project activities, measured against the without project scenario. 4 globally Endangered (EN) species of fauna can be found in the grouped project region and could potentially be benefitted from reduced threats as a result of project activities, measured against the without project scenario. |
| Expected Verification Schedule | 2025 (expected first verification), subsequent verifications every 3 years |

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# 1 SUMMARY OF PROJECT BENEFITS

The project “Serra do Sudeste” is a grouped project, falling under the Afforestation, Reforestation and Revegetation (ARR) category and targeting the following Verra certifications: Verified Carbon Standard (VCS), and Climate, Community & Biodiversity Standard (CCB).

The grouped project’s goal is to increase native forest cover in the project zone while respecting the natural boundaries and other vegetation native to the Pampa Biome. Therefore, the project is primarily aimed at locating areas that have been cleared of native forest in the past generations for reforestation purposes. Besides this, we locate areas in which conversion of their natural vegetation has already occurred for other land uses, such as agriculture or short-rotation silviculture plantations.

In the first instance, an area of 1119,8 ha will be afforested with a mix of native tree species at our project site “Fazenda Silêncio”, an area previously used for intensive cattle grazing. This chapter highlights some of this project’s important benefits. Project implementation will increase forest cover within the Pampa biome, improve landscape structure and functioning, safeguard the provision of critical ecosystem services and improve connectivity of highly fragmented forest patches in the region. Through project activities, several community benefits will accrue such as improvement of livelihoods, employment for local workers, training on new skills and education. Furthermore, the project facilitates the stimulation of a local restoration market through material sourcing, equipment acquisition and expert services from various local partners.

## 1.1 Unique Project Benefits

| Outcome or Impact Estimated by the End of Project Lifetime | Section Reference |
|---|---|
| 1) Creation of a regional network of nurseries, NGOs, educational institutions and local communities with a focus on land restoration and increase of biodiversity. | 4 |
| 2) Improvement of landscape structure and provision of critical ecosystem services such as those related to habitat connectivity, water regulation and erosion control through forest reforestation and afforestation of degraded areas. | 5 |
| 3) Conservation of rich biodiversity in native grasslands of the Pampa Biome by supporting sustainable grassland management initiatives and research. | 5 |
| 4) Demonstrating new markets based around the production and usage of native tree species, where this is currently not common practice. | 2 |

### 1.2 Standardized Benefit Metrics

| Category | Metric | Estimated by the End of Project Lifetime | Section Reference |
|---|---|---|---|
| GHG emission reductions or removals | Net estimated emission removals in the project area, measured against the without-project scenario | 441090,08 tCO2e.<br>(Accumulated over 30 years, 1119,8 ha in first project instance Fazenda Silêncio) | 3 |
| | Net estimated emission reductions in the project area, measured against the without-project scenario | Not Applicable | |
| Forest cover | For REDD1 projects: Estimated number of hectares of reduced forest loss in the project area measured against the without-project scenario | Not Applicable | |
| | For ARR2 projects: Estimated number of hectares of forest cover increased in the project area measured against the without-project scenario | 1119,8 ha (Fazenda Silêncio) | 5 |
| Improved land | Number of hectares of existing production forest land in which IFM3 practices are expected to occurred as a result of project | Not Applicable | |

[1] Reduced emissions from deforestation and forest degradation (REDD) - Activities that reduce GHG emissions by slowing or stopping conversion of forests to non-forest land and/or reduce the degradation of forest land where forest biomass is lost (*VCS Program Definitions*)

[2] Afforestation, reforestation and revegetation (ARR) - Activities that increase carbon stocks in woody biomass (and in some cases soils) by establishing, increasing and/or restoring vegetative cover through the planting, sowing and/or human-assisted natural regeneration of woody vegetation (*VCS Program Definitions*)

[3] Improved forest management (IFM) - Activities that change forest management practices and increase carbon stock on forest lands managed for wood products such as saw timber, pulpwood and fuelwood (*VCS Program Definitions*)

| | | | |
|---|---|---|---|
| management | activities, measured against the without-project scenario | | |
| | Number of hectares of non-forest land in which improved land management practices are expected to occurred as a result of project activities, measured against the without-project scenario | 2-5% of the project areas will be excluded from carbon calculations and will not be accounted for ERs. These areas will be used to implement innovative agroforestry projects where members of local communities will be directly involved. | |
| Training | Total number of community members who are expected to have improved skills and/or knowledge resulting from training provided as part of project activities | 50 (Fazenda Silêncio) | 4 |
| | Number of female community members who are expected to have improved skills and/or knowledge resulting from training as part of project activities | At the moment this benefit is not being quantified, but a program is being designed where female community members will have a key role in the supply chain of seeds and seedlings, the agroforestry plot management and non-timber forest product exploitation. | |

| | | | |
|---|---|---|---|
| Employment | Total number of people expected to be employed in project activities,4 expressed as number of full-time employees5 | 6 full-time employees, 50 local workers employed for project implementation (Fazenda Silêncio) | 4 |
| | Number of women expected to be employed as a result of project activities, expressed as number of full-time employees | Not Applicable | |
| Livelihoods | Total number of people expected to have improved livelihoods6 or income generated as a result of project activities | 50 families (Fazenda Silêncio) | 4 |
| | Number of women expected to have improved livelihoods or income generated as a result of project activities | 100 (Fazenda Silêncio)) | |
| Health | Total number of people for whom health services are expected to improve as a result of project activities, measured against the without-project scenario | Not Applicable | |
| | Number of women for whom health services are expected to improve as a result of project activities, measured against the without-project scenario | Not Applicable | |

[4] Employed in project activities means people directly working on project activities in return for compensation (financial or otherwise), including employees, contracted workers, sub-contracted workers and community members that are paid to carry out project-related work.

[5] Full time equivalency is calculated as the total number of hours worked (by full-time, part-time, temporary and/or seasonal staff) divided by the average number of hours worked in full-time jobs within the country, region or economic territory (adapted from the UN System of National Accounts (1993) paragraphs 17.14[15.102];[17.28])

[6] Livelihoods are the capabilities, assets (including material and social resources) and activities required for a means of living (Krantz, Lasse, 2001. *The Sustainable Livelihood Approach to Poverty Reduction*. SIDA). Livelihood benefits may include benefits reported in the Employment metrics of this table.

| | | | |
|---|---|---|---|
| Education | Total number of people for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario | 150<br>Average number of children per family (2) * number of workers employed in grouped project Serra do Sudeste (income for education, 50) + Number of workers (direct education and training from involvement in the project, 50) (Fazenda Silêncio) | 4 |
| | Number of women and girls for whom access to, or quality of, education is expected to improve as result of project activities, measured against the without-project scenario | 100<br>Average number of women per family (2) * number of workers employed (income for education, 50)<br>(Fazenda Silêncio) | 4 |
| Water | Total number of people who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario | Not Applicable | |
| | Number of women who are expected to experience increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario | Not Applicable | |
| Well-being | Total number of community members whose well-being7 is expected to improve as a result of project activities | 50 families<br>(Fazenda Silêncio) | 4 |

[7] Well-being is people's experience of the quality of their lives. Well-being benefits may include benefits reported in other metrics of this table (e.g. Training, Employment, Livelihoods, Health, Education and Water), and may also include other benefits such as strengthened legal rights to resources, increased food security, conservation of access to areas of cultural significance, etc.

| | | | |
|---|---|---|---|
| | Number of women whose well-being is expected to improve as a result of project activities | 100<br><br>Average number of women per family (2) * number of workers employed (income for well-being, 50)<br><br>(Fazenda Silêncio) | |
| Biodiversity conservation | Expected change in the number of hectares managed significantly better by the project for biodiversity conservation,8 measured against the without-project scenario | 1119,8 ha (Fazenda Silêncio) | 5 |
| | Expected number of globally Critically Endangered or Endangered species9 benefiting from reduced threats as a result of project activities,10 measured against the without-project scenario | 102<br><br>Araucaria angustifolia, Critically Endangered (CR). Actively planting seedlings of the species and enhancing its populations.<br><br>39 globally Critically Endangered (CR) and 58 globally Endangered (EN) species of flora can be found in the grouped project region and could potentially be benefitted from reduced threats as a result of project activities, measured against the without project scenario. | 5 |

[8] Managed for biodiversity conservation in this context means areas where specific management measures are being implemented as a part of project activities with an objective of enhancing biodiversity conservation, e.g. enhancing the status of endangered species

[9] Per IUCN's Red List of Threatened Species

[10] In the absence of direct population or occupancy measures, measurement of reduced threats may be used as evidence of benefit

| | | | |
|---|---|---|---|
| | | 4 globally Endangered (EN) species of fauna can be found in the grouped project region and could potentially be benefitted from reduced threats as a result of project activities, measured against the without project scenario. | |

# 2 GENERAL

## 2.1 Project Goals, Design and Long-Term Viability

### 2.1.1 Summary Description of the Project (G1.2)

The Serra do Sudeste Grouped Project aims to restore forest formations that are diminished due to the expansion of other land use practices such as overgrazing on extensive cattle ranches, intensive agriculture and silviculture systems. Restoration is attained through forestation activities using primarily native species and includes enrichment planting with valuable species as well as assisted natural regeneration. The overarching goal of the project is to create a natural and biodiverse forest that combines carbon capture with a diversity of other economic functions such as apiculture, sustainable production of crops and exploitation of forest products.

A variety of native tree species is planted across the eligible and suitable areas inside the project zone following the planting design. A careful selection of native tree species that are suited for the region is combined with planting species of commercial value. The final selection was made after meetings with the local community, forest engineers and government bodies. The mixed planting approach aims to keep the project focused on ecological restoration and at the same time, enables community and biodiversity benefits that can be generated by the forest in the long term. Diversification contributes to non-permanence risk mitigation and safeguards project benefits after the crediting period is over. Tree seedlings are planted according to their requirements related to edaphological parameters (soil texture, depth, fertility, drainage) and proximity to existing forest patches (e.g., pioneer or non-pioneer species). Finally, seedlings of the critically endangered (CR) *Araucaria angustifolia* are planted during forestation activities which creates unique biodiversity benefits arising from implementing the project.

The grouped project is located in the Pampa biome in Rio Grande do Sul, south of Brazil. The area has a humid subtropical climate (Gomez et al., 2020). The landscape is naturally characterised by grassland-forest mosaics. However, due to current land management and agricultural practices, native grasslands and forest cover has drastically been diminished and forest patches are currently fragmented and under constant pressure (Krob et al., 2021; Outeiral et al., 2018). In the broader project region, rural lands are increasingly being used for high-input agriculture such as soy crops and short-rotation silviculture. Land management involves high input of fertilisers, pesticides and herbicides in crops and tree plantations. This drastic land use change diminishes the area of natural grasslands traditionally used for cattle ranching. As a result, cattle farmers are contributing to land degradation by introducing exotic forage grasses and following overgrazing management as well as clearing and burning of woody vegetation. The latter serves in maintaining the landscape open and suitable for ranching to improve pasture productivity.

In the past decades, more than 2 million hectares of native grasslands in the Pampa biome were lost through conversion into crops, planted pasture, and forest plantations. This is extremely alarming, as the southern Brazil grasslands are among the most biodiverse grasslands in the world, representing 3500 plant species (Andrade et al., 2018), also providing a habitat for many animal species such as reptiles and amphibians, most of which are endemic to the Pampa biome (Iop et al., 2016; Verrastro & Martins, 2015). Therefore, next to restoration of native forests The Green Branch is conducting research for developing

conservation strategies for the south Brazilian grasslands with the goal of assessing the feasibility of implementing these on large scale.

To be eligible for tree planting, project areas were deforested from native vegetation more than 10 years ago. At the start of the project, implementation sites show degradation signs (such as gully erosion and bare soils) and abandoned eucalyptus stubble. Soils are prone to erosion and climatic conditions allow for the growth of forest, making the areas suitable for forestation using native species (Roesch et al., 2009).

The project aims to remove GHG-emissions through its afforestation and reforestation activities. Carbon will be sequestered in woody above- and belowground biomass, dead wood, litter, and as soil organic carbon. On average, 13,09 tCO2e. are stored per hectare per year throughout the crediting period. Each project instance shall have a minimum of 30 years for carbon crediting. New areas can be added under the grouped project until 5 years after validation, resulting in the grouped project crediting period of 35 years.

The community goals include providing employment opportunities to residents of the region, operational and technical training to local people (workers, neighbours and farmers), better income conditions for the landowners derived from the stability of the lease, partnership with local government departments and opportunities for long-term study and work, and raising awareness of the project.

With regards to biodiversity, the project focuses on increasing tree species richness and habitat for forest species by expanding the cover of native forest. Moreover, it aims to enhance the populations of threatened species by using such species for afforestation and reforestation. Finally, it intends on minimising overgrazing pressure and the risk of ecological damage due to fire.

### 2.1.2 Project Scale

AR CDM project activities with less than 16,000 tCO2e removals per year are considered small-scale afforestation and reforestation projects (UNFCCC 2013). The first project instance of this grouped project (Fazenda Silêncio) will remove on average 14.703,00 tCO2e. per year throughout the first 30 years after project implementation. Taking into account adding new project instances in the first years after the project start, the yearly removals over 30 years will exceed the threshold of 16.000 tCO2e per year. Thus, the grouped project is classified as a large-scale project.

| **Project Scale** | |
|---|---|
| Project | |
| Large project | X |

### 2.1.3 Project Proponent (G1.1)

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|---|---|
| Organization name | The Green Branch B.V. |
| Contact person | Kasper Kupperman |
| Title | Managing partner |
| Address | Herengracht 221, 1016 BG Amsterdam |
| Telephone | +31 6 13411853 |
| Email | k.kupperman@thegreenbranch.nl |

### 2.1.4 Other Entities Involved in the Project

| | |
|---|---|
| Organization name | Family Tomasetto |
| Role in the project | Landowner of Fazenda Silêncio |
| Contact person | Artur Tomasetto |
| Title | Agronomist |
| Address | - |
| Telephone | +55 559607-1207 |
| Email | arturtomasetto@gmail.com |

### 2.1.5 Physical Parameters (G1.3)

The grouped project zone encompasses the southern region of Rio Grande do Sul state and lies within the Pampa biome. The Brazilian Pampa corresponds to the northern portion of the Rio de la Plata grassland region (Andrade et al., 2018), also known as Uruguayan savanna ecoregion (Olson et al., 2001), and encompasses an area of 193.383 km2 (Instituto Brasileiro de Geografia e Estatística (IBGE), 2019). In Brazil, the biome is located between latitudes 28º00’ S and 34º00’ S and longitudes 49º30’ W and 58º00’ W occupying an area of 63% of the Rio Grande do Sul State. The Brazilian Pampa is located under the Paraná Basin and comprises four geological formations, also called geological provinces: (a) Sul-rio-grandense Shield; (b) Central Depression; (c) Serra Geral Formation; (d) Continental Shelf (Roesch et al., 2009). The Pampa has two main hydrographic basins: the Costeira do Sul and the Rio da Prata. Santa Maria, Uruguay, Jacuí, Camaquã, Ibicuí and the Vacacaí are some of the important rivers in this biome.

The landscape consists of a mosaic of grasslands, different types of shrublands and low forests, and gallery forests along rivers. Although many landscapes, especially when dominated by grassland, might appear simple and homogeneous at first glance, the Pampa harbour remarkable biodiversity with more than 2,100 plants only in grasslands (Boldrini et al., 2015), 158 reptiles and 60 amphibian species, most of them endemic of southern Brazil grasslands (Iop et al., 2016; Verrastro & Martins, 2015), more than 95 resident birds (Fontana & Bencke, 2015), and 109 mammal species (Luza et al., 2015). Because of the

natural grasslands, livestock production is one of the main economic activities in the biome.The Brazilian Pampa has both subtropical and temperate climates, showing four well-characterized seasons. The average annual precipitation in the Pampa region is ranging from 1200-1600mm (Roesch et al., 2009), the average temperature in the Biome is 18°C (Schaffner, 2020).

With regards to soils, the grouped project region covers the following soil types: Planosol, Phaeozem, Alisol, Leptosol, Vertisol (Fischer et al., 2008). These soils are classified as soils with high clay activity by ISRIC, the International Soil Reference and Information Centre, and form the major soil class of the Biome. Soils of low activity clay can only be found at the boundaries of the grouped project zone: Acrisols at the north-east border to the Atlantic Forest Biome, and Plinthosols and Nitisols at the north-west border. Lastly, a strip of sandy soils (Arenosols) is located along the coast of the Atlantic Ocean (Batjes 2009). Classification of soil types was done according to the Harmonized World Soil Database published by the FAO.

Through a spatial analysis of the grouped project region, we estimated the area of land under different management types, see Table 1 below. The area of land use and land cover in the pampa biome is obtained from Mapbiomas land use/land cover product in 2020. This dataset was acquired from google earth engine platform using the Mapbiomas toolkit from <https://github.com/mapbiomas-brazil/user-toolkit>. The dataset was downloaded in raster format which contains pixel value corresponding to the land use land/cover class. This dataset was converted into vector data, then geometry calculation was performed to get the value of the land use land cover area of all classes in the pampa biome. The analysis shows that the most prominent land cover type in the region is grassland, which is mainly used for livestock grazing.

*Table 1: Land Classes Pampa Biome*

| Land Class | Area (ha) | Area (%) |
|---|---|---|
| Non-Observed | 1,316,442.64 | 7.352% |
| Forest Formation | 2,140,345.82 | 11.954% |
| Forest Plantation | 538,434.86 | 3.007% |
| Wetland | 291,163.35 | 1.626% |
| Grassland (Pastizal, Formación Herbácea) | 6,241,133.71 | 34.857% |
| Pasture | 20,546.38 | 0.115% |

| | | |
|---|---|---|
| Mosaic of Agriculture and Pasture | 1,730,752.37 | 9.666% |
| Beach and Dunes | 97,430.72 | 0.544% |
| Urban Infrastructure | 141,737.20 | 0.792% |
| Other Non-Vegetated Area | 129,948.41 | 0.726% |
| Rocky outcrop | 25,896.22 | 0.145% |
| Mining | 1,467.19 | 0.008% |
| Aquaculture | 13.96 | 0.000% |
| River, Lake and Ocean | 473,223.13 | 2.643% |
| Soy Beans | 2,387,406.20 | 13.334% |
| Rice | 1,236,685.71 | 6.907% |
| Mosaic of Crops | 1,131,014.80 | 6.317% |
| Wooded Restinga | 1,394.49 | 0.008% |
| **Total area** | **17,905,037.16** | **100.000%** |

The geolocation and boundaries of the first project instance, Fazenda Silêncio (see Figure 1), can be found in a .KML file in the Attachment. Also, the cadastral registration of the first project instance can be found in the supporting documents.

*Figure 1: Project location Fazenda Silêncio within Rio Grande do Sul*

A high-resolution spatial analysis of the project site Fazenda Silêncio was performed by combining and modifying open-source datasets in QGIS, resulting in elevation maps, satellite imagery and vegetation maps. Data with 1,5m resolution was bought from Spot 6. This satellite records blue, green, and red light in the visible spectrum as well as near-infrared, mid-infrared, and thermal-infrared light. Near infrared is the part of the spectrum that is reflected by healthy plants. Together with the visible colour green this indicates differences in vegetation, for example grass or trees. Combined with sample points taken across the farm fields these vegetation differences could be classified into grass, shrubland and forest, resulting Figure 2. The stratification clearly shows the pre-project forest patches, serving as a reference to check its existence throughout the project crediting period and to locate sample plots for biomass measurement in pure grassland fields that are planted during project implementation, thereby preventing the monitoring of pre-project woody biomass. A similar approach will be taken when adding new project instances, unless there is a better suited methodology available at that time.

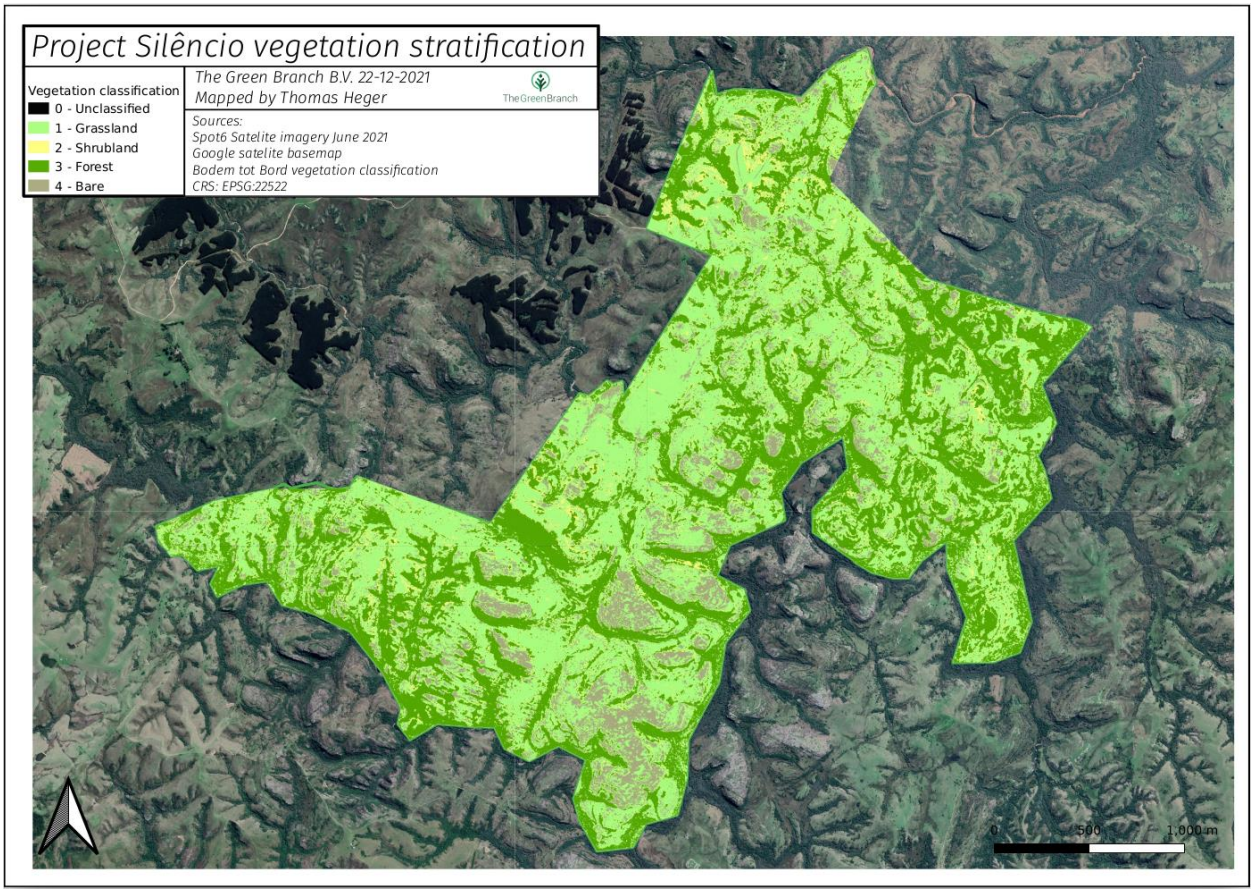


*Figure 2: Project Silêncio vegetation stratification*

### 2.1.6 Social Parameters (G1.3)

The grouped project area encompasses the territorial extent of the Pampa biome in the south of Brazil which includes 166 municipalities (out of 496) of the Rio Grande do Sul state (Verdum et al., 2019). The southern region of the state of Rio Grande do Sul has distinct characteristics in relation to its northern half. The municipalities of south RS present development rates far below the others, in addition to very different economic, social and environmental characteristics. This region is considered to have a lower development than other regions, especially when considering some indices such as GDP per capita, the participation of the industrial sector in the Tax Added Value (the main criterion for calculating the IPM – Municipal Participation Index) and in the generation of jobs and, over the years, the continuous and sharp drop in the number of inhabitants. Associated indicators for the region are significantly lower even compared to the north half of the state, which is considered to have better indicators and, consequently, more developed for economic activities such as industry and agriculture (Matei & Filippi, 2013).

The majority of the inhabitants live in cities. The Brazilian Institute of Geography and Statistics registered a high migration from the countryside to the cities, mainly caused by the need for labour in the large urban centres. A comparison between the cities in the north and south of Rio Grande do Sul, showed a considerably lower Social Development Index (SDI) in the south, where the Pampa biome is located. This index is based on data of education, households, labour and income. Increased costs of consumer goods

transportation to the South also contribute to the discrepancies in SDIs. The differences between northern and southern regions of Rio Grande do Sul are not only geographical but also related to the history of colonization (Roesch et al., 2009).

The region had the Charruas indigenous as its first inhabitants. At the end of the 17th century, the Portuguese and Spanish arrived in the region. Portugal and Spain focused on resource exploitation based on monoculture and livestock farming, thereby shaping the historic land use in the Biome. The residents of the Pampas biome are called 'Gaúchos', which is derived from the tradition of livestock farming on the native grasslands of the region (Roesch et al., 2009).

Despite the trend of population migration to cities, rural areas are of great economic importance for primary production through agriculture and livestock farming. In the last decades, an intensification of and expansion of agricultural activities took place. The vast majority of land uses and economic activities in the region surrounding the project sites are cattle ranching and summer crops, such as soybeans. More recently, the eucalyptus plantations have arisen. The region also has a terroir profile and a vocation for viticulture, with local investment from wineries.

Before colonization, the native people had their own religion, but since then, the catholic religion predominates, followed by the evangelical religion (IBGE, 2021).

### 2.1.7 Project Zone Map (G1.4-7, G1.13, CM1.2, B1.2)

The grouped project zone is defined as the Pampa biome within Brazil. All grouped project instances will occur within the boundaries of the aforementioned biome. The defined boundaries are also where all project activities will be implemented and will directly affect the without-project baseline related to community. The Pampa Biome in Rio Grande do Sul has a spatial extent of 17,905,037 ha and covers 166 municipalities (IBGE, 2021; Verdum et al., 2019). All human settlements found within grouped project boundaries are illustrated in Figure 3.

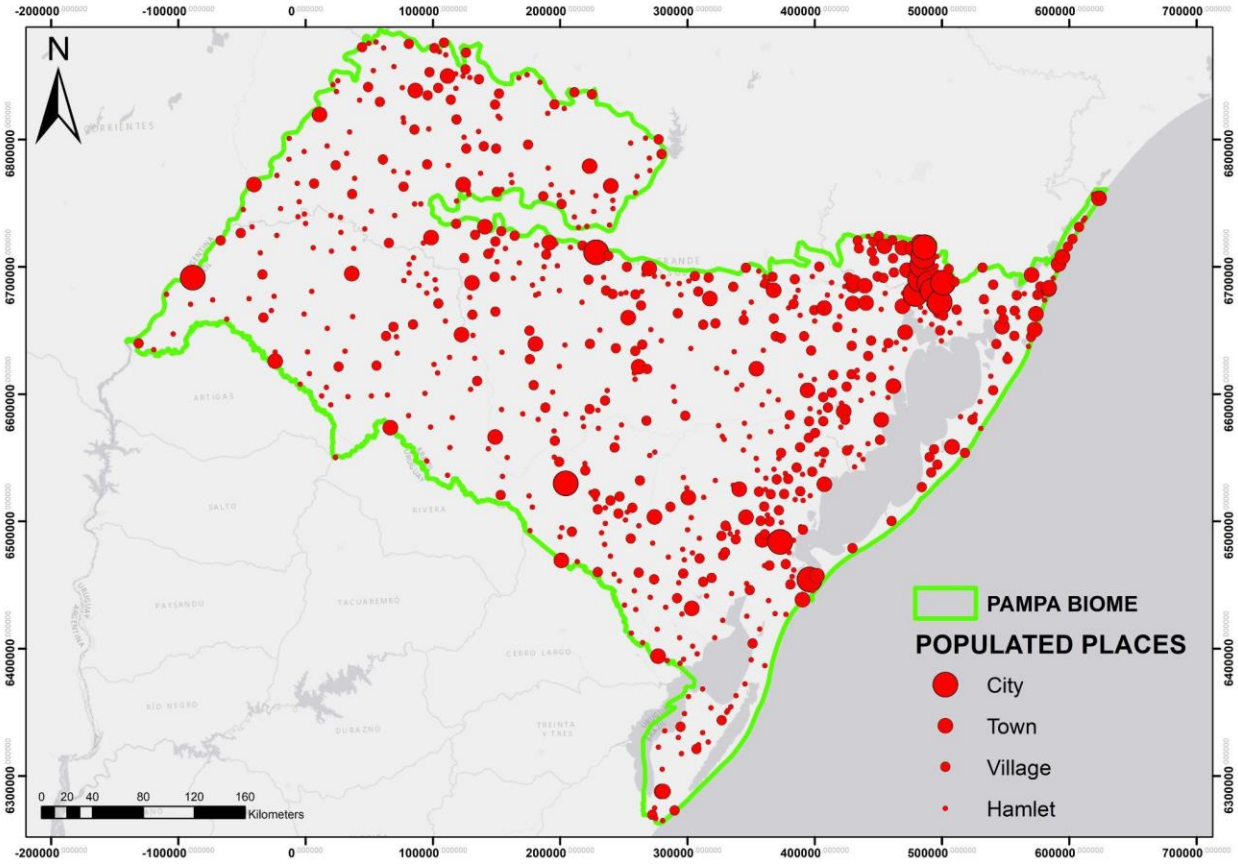


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*Figure 3: Communities in grouped project area*

The project instance of Fazenda Silêncio is located at the boundaries between the municipalities of Bagé and Pinheiro Machado and it covers an area of 2953 hectares. Figure 4 contains a map of the Rio Grande do Sul state where the grouped project zone is situated (top left), a map of the grouped project zone within the state (middle left), a map of Fazenda Silêncio grouped project instance within the grouped project boundaries (bottom left) and finally, a map of Fazenda Silêncio grouped project instance showing eligible and ineligible areas within its boundaries (right).

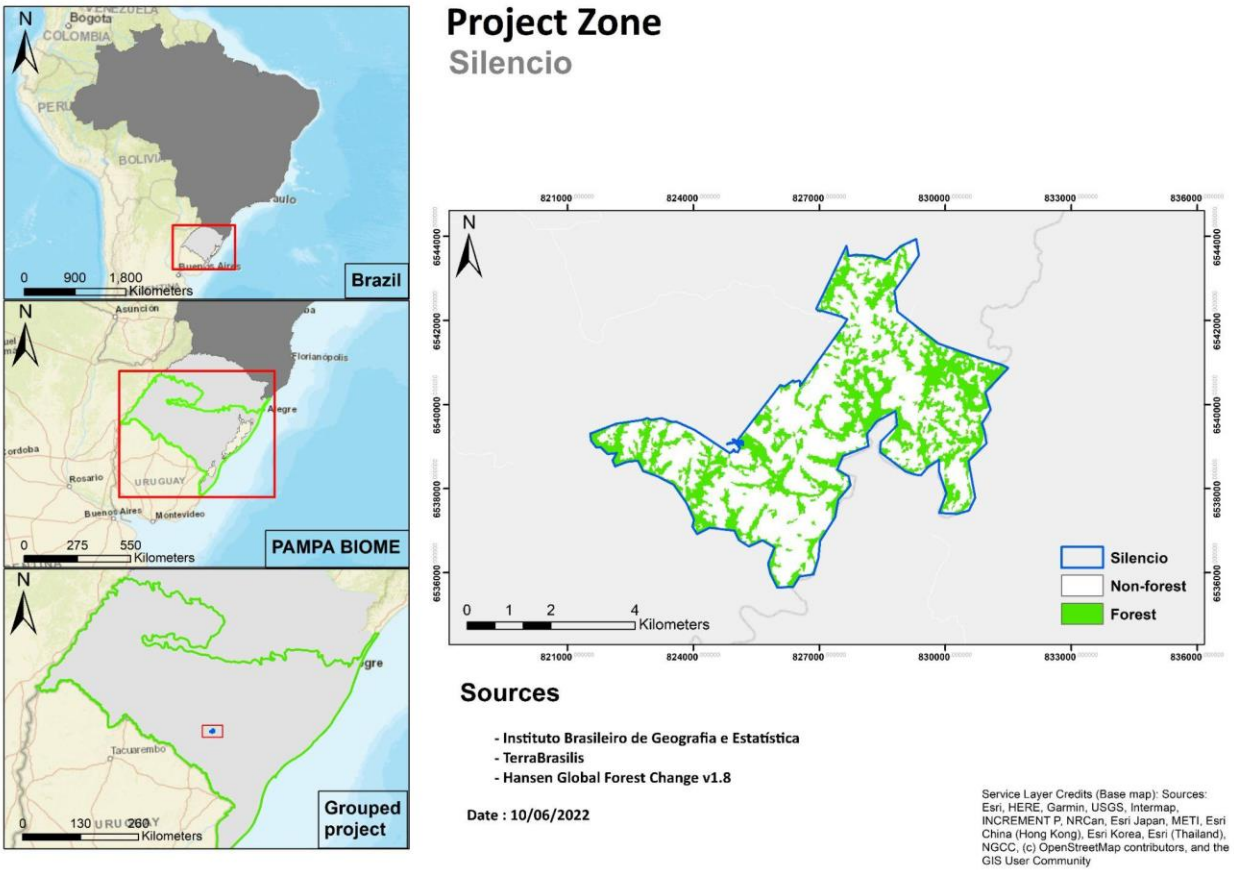


*Figure 4: Project Zone Silencio*

Eligible areas are those that at the date of project start are not forested and have not been deforested in the last 10 years prior to this date (deforestation here refers exclusively to conversion of native vegetation). Project instance boundaries define the area where all project activities will be implemented and will directly affect the without-project baseline related to climate and biodiversity.

A map showing high conservation value areas in and around the first project instance, Fazenda Silêncio, is represented in Figure 17 (chapter 4.1.3).

### 2.1.8 Stakeholder Identification (G1.5)

The proponent hired local employees working at the project in different positions (operational, technical, managerial). In addition, meetings were held with the organisation responsible for rural extension, which helped to identify the relevant stakeholders around the first project instance area.

During a brainstorming session with local informants, all possible stakeholders were listed, after which a combination of methodologies was used to classify the stakeholders and community groups (SBIA, 2011; CARE, 2002):

- Investigate their interests, roles, relative power and capacity and motivation to participate;
- Analyze each group in terms of their influence and importance;
- Identify relationships with other stakeholders.

To gain more knowledge and acquisition of data, such as high conservation values and impressions about the project, identified stakeholders were contacted via telephone, e-mail and visits for applying the methodology of Rapid Rural Appraisal. The gathered information helped describe different groups and identify benefits, risks and HCV.

### 2.1.9 Stakeholder Descriptions (G1.6, G1.13)

The following table describes the rights, interests and relevance of the identified stakeholders.

*Table 2: Stakeholder descriptions*

| Stakeholder | Rights, Interest and Overall Relevance to the Project |
|---|---|
| LAND OWNERS | Rights:<br>● Receiving information about project activities and success.<br>● Providing recommendations about potential improvements to enhance project success.<br>● Discuss and provide comments on project activities and impact on local communities, climate and biodiversity.<br><br>Interest:<br>● Establishment of sustainable land-use practices that provide long-term economic benefits while increasing the ecological resilience of the land.<br><br>Relevance:<br>● Direct participation in the project.<br>● Beneficiaries of project impact related to economics, climate, community, and biodiversity. |
| MECHANICAL AND MANUAL IMPLEMENTATION PARTNERS | Rights:<br>● Be provided with fair working conditions.<br>● Compliance with national labour laws as well as B-Corp and CCB certification commitments.<br>● Be trained in forestry techniques related to the implementation of a sustainable carbon forest. |

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| | • Discuss and provide comments on improvements of work environment, project activities and impact on local communities, climate and biodiversity.<br><br>Interest:<br>• Develop skills to work in forestry.<br>• Financial security through fair income.<br><br>Relevance:<br>• Direct participation in the project through workforce for planting activities.<br>• Indirect beneficiaries of project impact related to climate, community, and biodiversity. |
| NEIGHBOURS | Rights:<br>• Discuss and provide comments on project activities and impact on local communities, climate and biodiversity.<br><br>Interest:<br>• Neighbours of the project area derive income, livelihood and cultural values from the project zone. They are interested in economically, ecologically and socially sustainable land-use practices such as the proposed grouped VCS and CCB project.<br><br>Relevance:<br>• Might become interested in ARR projects in their field.<br>• Direct beneficiaries of climate, biodiversity and community benefits. |
| LOCAL SUPPLIERS | Rights:<br>• Discuss and provide comments on project activities and impact on local communities, climate and biodiversity.<br>• Provide recommendations for enhancement of project activities according to expertise (e.g. on machinery and planting materials).<br><br>Interest:<br>• Develop their economic activities and get income from a new source (inputs for forest implementation and maintenance of equipment).<br><br>Relevance:<br>• Providing products and services to the project proponent.<br>• Indirect beneficiaries of project impact related to climate, community, and biodiversity. |
| TGB | Rights: |

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| | • Ownership of project as project proponent.<br>• Management of all project activities, including implementation, maintenance, certification, and sale carbon credits.<br><br>Interest:<br>• Implementing a successful ARR strategy, providing environmental, economical and social benefits to the global community and direct stakeholders.<br>• Economic sustainability of the project to ensure business continuity.<br><br>Relevance:<br>• Initiation and execution of project activities. |
| GOVERNMENT AGENCIES:<br>- FEPAM (State Foundation for Environmental Protection, *Fundação Estadual de Proteção Ambiental Henrique Luis Roesseler/RS*)<br>- EMATER (Institute of Technical Assistance and Rural Extension, *Instituto de Assistência Técnica e Extensão Rural*)<br>- EMBRAPA (Brazilian Agricultural Research Corporation, *Empresa Brasileira de Pesquisa Agropecuária)* | Rights:<br>• Ensure compliance with national forestry and environmental laws.<br>• Discuss and provide comments and recommendations on project activities and impact on local communities, climate and biodiversity.<br><br>Interest:<br>• Ensure sustainable land use practices by verifying compliance with existing forestry and environmental regulations.<br><br>Relevance:<br>• Governmental authorities. |
| UNIVERSIDADE DA REGIÃO DA CAMPANHA | Rights:<br>• Discuss and provide comments and recommendations on project activities and impact on local communities, climate and biodiversity based on research and academic knowledge.<br><br>Interest:<br>• Long-term collaboration to conduct research on the seedling survival rates and growth patterns of planted species in the project zone. |

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| | Relevance:<br>● Provision of academic research and knowledge to enhance project success and sustainability impact. |
| OTHER RESEARCH INSTITUTES<br>- INTEC (The Biotechnological Institute of Plant Reproduction, *Instituto Biotecnológico de Reprodução Vegetal*)<br>- Laboratory of Seed Analysis (*Laboratório de Análises de Sementes*) | Rights:<br>● Discuss and provide comments and recommendations on project activities and impact on local communities, climate and biodiversity based on research and academic knowledge.<br>Interest:<br>● Conducting research on the seeds that TGB donated to the institutes.<br>Relevance:<br>● Provision of academic research and knowledge to enhance project success and sustainability impact.<br>● Potential partnership is in discussion as the institutes could raise native tree seedlings for future project areas. |
| LOCAL INHABITANTS | Rights:<br>● Respect local culture and values.<br>● Equal rights to apply for employment opportunities around the project activities.<br>● Discuss and provide comments on project activities and impact on local communities, climate and biodiversity based on research and academic knowledge.<br>Interest:<br>● Creation of regional jobs under fair working conditions to enhance community welfare.<br>● Establishment of sustainable land use practices in the region that have a positive impact on community, climate and biodiversity.<br>Relevance:<br>● Indirect beneficiaries of project impact related to climate, community, and biodiversity. |
| AGrUPa (Association for Greatness and Union of Palmas, *Associação para Grandeza e União de Palmas*) | Rights:<br>● Discuss and provide comments on project activities and impact on local communities, climate and biodiversity based on research and academic knowledge.<br>Interest:<br>● Promoting union and sustainable development in the region, acts against the installation of large mining projects in the Pampa |

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| | biome, by defending the territory of Alto Camaquã and its communities and traditional people.<br><br>Relevance:<br>● NGO with local network. |

### 2.1.10 Sectoral Scope and Project Type

The Serra do Sudeste grouped project is an AFOLU (Agriculture, Forestry and Other Lands Use) project under the sectoral scope 14 “Agriculture, Forestry and Other Land Use” and falls specifically under the ARR (Afforestation, Reforestation and Revegetation) category. The project is developed under the Verified Carbon Standard (VCS) and Climate, Community & Biodiversity Standards (CCB) of Verra.

### 2.1.11 Project Activities and Theory of Change (G1.8)

A detailed description of project activity can be found in 2.1.1.1 (Description of project activity). Certain critical factors in the without-project scenario have been identified (see list below). These factors perpetuate degradation cycles and restrict the possibilities for sustainable transition to alternative land use and revenue models. With the project, preventive factors are directly influenced by the related activities and enable a pathway for improvement. For predicting how the grouped project aims to achieve its climate, community and biodiversity objectives, the principles of Theory of Change (Richards & Panfil, 2011) were applied to foresee the influence on the identified factors. Activities described in

Table 3 (together with their outputs, outcomes, impacts and relevance to project's objectives), may relate to one or a combination of factors:

1. Unsustainable land use practices.
2. No capacity to transition to alternative revenue models from using the land.
3. Limited options of employment for local people other than in conventional agriculture.
4. Limited knowledge around ARR potential and climate change.

*Table 3: Project Activities*

| **Activity description** | **Expected climate, community, and/or biodiversity** | | | **Relevance to project's objectives** |
|---|---|---|---|---|
| | **Outputs (short term)** | **Outcomes (medium term)** | **Impacts (long term)** | |
| Project design<br>(Factor 3) | Purchase of seedlings from local nurseries. | Form partnerships with local restoration initiatives. | Stimulate the local restoration market and contribute to the creation of a local restoration movement. | Community benefits: generate sales for local initiatives and connect them with the international market. |
| Project Implementation: active tree planting of various species (incl. endangered)<br>(Factors 1, 2, 4) | Number of seedlings in the field, number of species, number of endangered individuals, restored area. | Revenues from the carbon sale, land rehabilitation and degradation cycles halted, alternative income for the land owners. | CO2 sequestration, increase in quantity and quality of forest cover and habitat for forest species, increase tree species richness, increase connectivity of fragmented forest patches, restoration of landscape structure and functioning, enhancement of threatened species populations. | Climate benefits: Emission removals are achieved.<br><br>Biodiversity benefits: improve habitat cover and composition, improve provision of ecosystem services related to biodiversity, soil and water. |
| Project Implementation and maintenance<br>(Factors 2, 3, 4) | Number of employees, number of trained people, local women hired. | Novel work experience, training in safety and technology, great income, knowledge of ARR techniques. | Better well-being conditions, social and personal development, establish a precedent of a carbon financed project in local society. | Community benefits: increase in local employment opportunities, knowledge and education on ARR and sustainable land management. |
| Project Implementation<br>(Factor 4) | Contact with neighbours. | Greater awareness, environmental education provided by upcoming meetings (ARR). | Educational opportunities and decrease in rural exodus, appreciation and interest of local people in the project. Strengthen connection of locals with | Community benefits: educate and share knowledge about ARR and sustainable land management models. |

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| | | | natural elements of the area. | |
| Project Implementation<br>(Factors 2, 3) | Contact with government agency stakeholders (Rural Extension Department). | Development of a partnership project (e.g. orchard implementation). | Better well-being conditions. | Community benefits: income stream, employment opportunities. |
| Project monitoring<br>(Factors 3, 4) | Job creation. | Improved income, knowledge sharing and training, familiarity with ARR principles. | Long-term job opportunities, long lasting knowledge and skills. | Community benefits: alternative livelihoods, income stream, training/ education monitoring techniques & sustainable land management. |
| Project monitoring<br>(Factor 1) | Checking status of pressures and threats. | Reduced impacts of pressures & threats. | Process of ecological succession is enabled, seedlings survive and grow, forest growth becomes possible, soil health and structure are improved. | Climate benefits: biomass builds up, sequestering carbon in the process.<br><br>Biodiversity benefits: habitat cover and structure is improved, impacts of pressures and threats on soil and vegetation are minimised. |

### 2.1.12 Sustainable Development

In 2015, during the United Nations General Assembly, the federal government of Brazil committed to the 2030 Agenda, and thereby stated to aim for achieving the targets of the Sustainable Development Goals (United Nations, 2017). The expected contribution of the Serra do Sudeste grouped projects towards reaching the SDGs is explained below.

*Table 4: Project impact on SDGs*

| SDG | Project impact on SDG |
|---|---|
| SDG 2: Zero Hunger | The proposed ARR project supports sustainable food production systems by maintaining native forest ecosystems that provide non-timber products such as fruits and wild honey. Productivity of degraded land is improved by changing from an extensive cattle pasture system to establishing a forest cover that represents the genetic diversity of native tree species. Afforestation and reforestation will restore roots in the soil, preventing erosion. Roots retain water and promote water absorption, reducing water runoff. |
| SDG 4: Quality Education | Collaboration with universities to conduct research related to ARR efforts. We support scientists and students in exploring mostly unstudied topics related to afforestation and reforestation in the region, such as biomass growth models and impacts of the projects on biodiversity and community welfare. Therefore, project sites are open for field work of local universities and supplementary data can be shared upon request. Furthermore, field trips are organised to the project sites with local schools to transfer knowledge about ARR and its benefits at an early age.<br><br>Local workers employed for the project implementation and maintenance are trained in ARR techniques to ensure shared understanding of our sustainable development values. To support permanent forest cover beyond the project lifetime, landowners are informed about sustainable forest management practices. |
| SDG 6: Clean Water and Sanitation | Project activities will result in water quality enhancements downstream due to increased forest cover in the area that improves water filtering, storing it in the aquifer and retaining sediments from entering waterways. |
| SDG 8: Decent Work and Economic Growth | The project introduces an alternative land use activity in the project region, diversifying business opportunities in the region. Economic productivity is increased by establishing new jobs for local workers under fair working conditions with an above-market income, as well as long-term financial stability for the land owners. |
| SDG 12: Responsible Consumption and Production | The project supports sustainable management and efficient use of natural resources. Amongst others, the projects generate essential pollination services, which enables local entrepreneurship with the creation of apiculture businesses |

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| | on suitable projects. Furthermore, planting part of the project areas with commercial species allows landowners to carry out sustainable forest management after the first carbon crediting period. Trees then could be harvested selectively while ensuring a permanent forest cover and habitat for native fauna and flora. |
| SDG 13: Climate Action | Through the ARR projects CO2 is actively removed from the atmosphere and stored in the soil and vegetation, thereby combating climate change. Locally, the forest cover creates a cooling effect and safeguards the capacity of the landscape to provide valuable ecosystem services in the future. The diversity of tree species planted increases resilience and adaptive capacity to climate-related hazards and natural disasters. Stakeholder consultations allow for interactive discussions about the impact of the proposed ARR activities on the region's capacities to mitigate and adapt to climate change. |
| SDG 15: Life on Land | The ARR activities create havens for depleted forest biodiversity in the South of Rio Grande do Sul. In our project area, we are actively working on strengthening populations of Araucaria angustifolia populations, a species listed as Critically Endangered (CR) in the IUCN Red List. Furthermore, the projects enhance landscape complexity by improving connectivity of highly fragmented forest patches in the area, functioning as wildlife corridors.<br><br>Restoring the degraded land also improves soil fertility and structure in the following aspects: Micro-organisms, Micro- and macro nutrients, Soil structure, Soil organic carbon, Water retainment, Erosion and soil depth.<br><br>The project creates a precedent in the region for alternative economic models such as carbon crediting and sustainable forest management. Implementing these alternatives demonstrates their viability and motivates locals to change their perceptions of land use options. |
| SDG 17: Partnerships for the Goals | Project aspects (design, implementation, monitoring & management) supports multi-stakeholder partnerships, as its projects bring farmers, NGOs, governmental authorities, universities and other stakeholders together to create and share knowledge and expertise. Therefore, we organise gatherings and events for local communities and stakeholders and create a structure with local partners that can streamline ARR projects and stimulate the local restoration market. Furthermore, project data is shared on the open-source platform Restor to improve worldwide data on restoration. We also enable field work for researchers at the ARR sites and share additional project data upon request. To |

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| | enhance protection of the threatened and culturally important Camaqua river we collaborate with local NGOs. |

### 2.1.13 Implementation Schedule (G1.9)

The following implementation schedule represents the project implementation steps for the first project instance Fazenda Silêncio.

*Table 5: Implementation Schedule*

| Date | Milestone(s) in the project's development and implementation |
|---|---|
| 09//2021 | Project preparations: Soil preparation and fertilisation; Arrival of seedlings; Construction of fences; Training of local workers; |
| 09/10/2021 | Project implementation: Planting of seedlings; Start of crediting period; |
| 04-06/2022 | Finalisation of project implementation; |
| 2021-2022 | Design of Biomass Monitoring Plan; Design of Adaptive Management Plan; |
| 2022 (anticipated) | Expected validation of grouped project; |
| 2022-2027 | Acquisition and project development of new project instances; |
| 2025 (anticipated) | Expected first verification; First possibility to add other project areas in grouped PD; |
| 10/2056 | End of grouped project crediting period. |

### 2.1.14 Project Start Date

The grouped project activities start with 09.10.2021, the day when the planting of seedlings at Project Fazenda Silêncio started.

### 2.1.15 Benefits Assessment and Crediting Period (G1.9)

The carbon crediting period of project Fazenda Silêncio starts with 09.10.2021, the start day of implementing afforestation activities at its site. As other project instances are planned to be added to the grouped project and implemented within the first years after the project start date, the grouped project crediting period will be 35 years (09.10.2021-08.10.2056). This should assure a minimum of 30 years for carbon credit generation for every project instance.

### 2.1.16 Differences in Assessment/Project Crediting Periods (G1.9)

There are no differences between the carbon crediting period and the community and biodiversity assessment periods, since the latter are, just as the carbon sequestration, dependent on the start date of the ARR activities.

### 2.1.17 Estimated GHG Emission Reductions or Removals

Table 6: Estimated GHG Emission Removals below represents the estimated accumulated GHG emission removals for the first 30 years of the first project instance, Fazenda Silêncio. The planted area is 1119,8 ha and the buffer has already been subtracted from the values.

*Table 6: Estimated GHG Emission Removals*

| Year | Estimated GHG emission reductions or removals ($tCO_2e$) |
|---|---|
| 2021 (Oct-Dec) | 3187,8405 |
| 2022 | 17039,7665 |
| 2023 | 30891,6925 |
| 2024 | 44743,6185 |
| 2025 | 58595,5445 |
| 2026 | 72447,4705 |
| 2027 | 86299,3965 |
| 2028 | 100151,323 |
| 2029 | 114003,249 |
| 2030 | 127855,175 |
| 2031 | 148918,613 |
| 2032 | 169982,051 |
| 2033 | 191045,489 |
| 2034 | 212108,927 |

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|---|---|
| 2035 | 233172,365 |
| 2036 | 254235,803 |
| 2037 | 275299,241 |
| 2038 | 296362,679 |
| 2039 | 317426,117 |
| 2040 | 338489,555 |
| 2041 | 359552,993 |
| 2042 | 367436,385 |
| 2043 | 375834,885 |
| 2044 | 384233,385 |
| 2045 | 392631,885 |
| 2046 | 401030,385 |
| 2047 | 409428,885 |
| 2048 | 417827,385 |
| 2049 | 426225,885 |
| 2050 | 434624,385 |
| 2051 (Jan-Sept) | 441090,08 |
| Total number of crediting years shown in this table | 30 |

### 2.1.18 Risks to the Project (G1.10)

Table 7 below presents identified natural and human-induced risks to the expected climate, community and biodiversity benefits during the project lifetime and outlines measures needed and designed to mitigate those risks.

*Table 7: Risks to the Project*

| Identify Risk | Potential impact of risk on climate, community and/or biodiversity benefits | Actions needed and designed to mitigate the risk |
|---|---|---|
| Bribery | Bribery is a serious offence which can be punishable by law. Bribing would create complications to project implementation and can spur a series of unwanted situations such as the ones related to law, public image and local approval. | Policy in place to mitigate such events. |
| Corruption / fraud | Proper project implementation might not be attained if budgets are misplaced due to corruption. Fraud would shake the trust of local partners towards the project and can pose a huge PR risk. | Policy in place to mitigate such events. |
| COVID-19 | Covid outbreak in the planting team would delay project implementation. | Taking preventive covid tests to all people that enter the project. On the project there are general covid procedures. |
| Fire | Vegetation (biomass) would be lost due to fire outbreaks. | Fire response plan implementation, purchase of firefighting equipment. |
| Illegal deforestation | Reforestation/afforestation operations typically cover up large land areas, making them difficult to monitor regularly and offering more opportunities for illegal entities to accomplish their goal of stealing plants/trees from the forest. Risk of biomass reduction in forest. | Systematic monitoring of the project site using drones and ground patrols. |

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| Lack of available planting materials or its quality. | Lack of planting materials or materials of low quality, will impact project implementation and potentially project success. | We have established a network of certified growers that follow a 1-year seed collection and seedling grow plan for the amounts of seeds and seedlings we need. If they cannot deliver, we have other species as backup that will suffice the planting need. Prepayments and reservations have been made. If this cannot be redeemed however, part of the planting will be postponed to another planting season. |
| Grazing | Tree growth would be impacted by herbivory. | Fences are installed and maintained around the project sites. Systematic monitoring of grazing pressure and implementation of response measures. |
| Drought | Tree health would be impaired from drought related stress. | Systematic monitoring of plant health and implementation of response measures such as application of mulch or removal of weeds. |
| Waterlogging | Some trees would be lost due to soil waterlogging after periods of increased rainfall. | Systematic monitoring of plant health and implementation of response measures such as draining waterlogged plots. |
| Low rates of seedling survival and seed germination | Biomass estimations would be miscalculated if there are less trees than what was estimated for the project. In addition, biodiversity related objectives such as forest cover and habitat increase would be compromised. | Systematic monitoring of plant health and replanting if necessary. |
| Diseases and pests | Forest growth and/or cover would be impaired if the trees are infected by a disease or pest. | Planting a biodiverse mix of native tree species to reconstruct the structure and functioning of a natural forest. This makes our forests more resilient. Systematic monitoring of plant health. |
| Project longevity | Biomass might be removed after the project & contract with the landowner ends (30 years). | Planting commercial species for sustainable forest management after project completion to ensure continuous biomass stock. |

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| Low community engagement. | Positive impacts of the project on well-being of all local communities might not be ensured. Local farm workers might see reforestation as a threat to the cattle ranching lifestyle. | Extreme attention to creating a good social image and ensuring local approval of the projects. Organising local events with stakeholders and community members, hiring local partners and employees, social media campaigns. Direct neighbours will get better pasture due to better water retainment. Also, there are a lot of people and organizations active in the region that want to protect the biome and its people. They approve of our plan since it is good for the environment and the people partaking get compensated for managing the forest. |
| Political instability, weak control of corruption, low government effectiveness, accountability and regulatory quality due to Governance score of -0.18025 in Brazil (Source: WGI dataset 2019) | Delay or prevention of project implementation. | The country is receiving REDD+ Readiness funding from the FCPF, UN-REDD or other bilateral or multilateral donors. The country is participating in the CCBA/CARE REDD+ Social and Environmental Standards Initiative. The country has an established national FSC or PEFC standards body. The country has an established DNA under the CDM and has at least one registered CDM A/R project. |
| Eucalyptus regrowth | Eucalyptus suppressing native tree species compromising their growth, health and overall biodiversity objectives. | When planting on previous Eucalyptus plantations, resprouted Eucalyptus will be cut with either a machete or chainsaw. In addition, an organic acidic solution will be applied to the Eucalyptus stumps to weaken the trunk. This process will be repeated until the Eucalyptus trunks are dead. The Eucalyptus biomass is then turned into forest woodchips through mulching to accelerate carbon and nutrient cycling of the material in the soil and enable mechanized planting interventions. |
| Ongoing enforcement to prevent encroachment by outside actors is required to protect more than 50% of stocks on which GHG credits have previously been issued. | Not applicable. | The land and its contents are rightfully owned by the landowners and there is no history or risk of any encroachment by outside actors. |

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|---|---|---|
| Management team does not include individuals with significant experience in all skills necessary to successfully undertake all project activities (ie, any area of required experience is not covered by at least one individual with at least 5 years of experience in the area). | Not applicable. | Management team includes: - Maurício Rochinhas Clavijo our local operations manager who has more than 10 years of experience in forestry. Implementation by João Marques de Borba +30 years of rural experience - Hub manager João Ricardo Titton Bruger with +30 years of rural experience |
| Management team does not maintain a presence in the country or is located more than a day of travel from the project site, considering all parcels or polygons in the project area. | Not applicable. | We have farmers in charge of operations on site and the closest management team is located in Bagé, which is 1.5 hours drive to the project sites. |
| Project cash flow breakeven point is greater than 10 years from the current risk assessment | Not applicable. | Project cash flow breakeven point is less than 4 years from the current risk assessment. There is no time in the project where there is a negative cash flow, ensuring financial stability. |
| Project has secured less than 15% of funding needed to cover the total cash out before the project reaches breakeven | Not applicable. | Project has secured 80% or more of funding needed to cover the total cash out before the project reaches breakeven. Before the project implementation starts, more than 118% of the total cash out will be funded. |
| NPV from the most profitable alternative land use activity is expected to be higher than that associated with project activities; or where baseline activities are subsistence-driven, net positive community impacts are not demonstrated | Not applicable. | NPV from project activities is expected to be between 20% and up to 50% more profitable than the most profitable alternative land use activity. |
| Ownership and resource access/use rights are held by different entity(s) (e.g., land is government owned and the project proponent holds a lease or concession) | Not applicable. | Ownership and resource access/use rights are held by same entity(s) |

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| There exist disputes over access/use rights (or overlapping rights) in the project area. | Not applicable. | There are no disputes over land ownership in the project area. See CAR registration. |
| WRC projects unable to demonstrate that potential upstream and sea impacts that could undermine issued credits in the next 10 years are irrelevant or expected to be insignificant, or that there is a plan in place for effectively mitigating such impacts. | Not applicable. | Project does not fall in WRC project category |
| Extreme weather | Not applicable. | There is no history of extreme weather decreasing carbon stocks. There is an occasional lightning strike, resulting in no losses. |
| Geological risk | Not applicable. | There is no history or reason to assume geological risk. |

### 2.1.19 Benefit Permanence (G1.11)

The proposed ARR activities intend to establish permanent forest cover and attain long lasting carbon sequestration at the project sites. Using a diverse selection of native species in the project area for forestation and eradicating pressures, enables Assisted Natural Regeneration and the associated benefits will have spill over effects beyond the geographic and temporal project boundaries. To support a stable biomass stock in the project areas, also after the first carbon crediting period, commercial species are planted during project implementation. These can be subject to selective harvesting, following the concept of Sustainable Forest Management (SFM). This concept will ensure a stable income for the landowners from forestry without the need of changing the land use, and deforesting the project area, after the carbon crediting period. Important to note is that any type of harvest will only happen after the first project crediting period. In case of contract extension to a second carbon crediting period, potential harvesting of commercial species will be accounted for in the carbon model. Also, if wood is harvested through any unforeseen circumstances in the first carbon crediting period, it will be accounted for. In case thinning of commercial tree species will be necessary to assure production of high-quality timber, the biomass loss will be quantified accordingly and subtracted from the project emission removals.

Practising SFM allows keeping a balance between ecological, economic and socio-cultural ecosystem services. The purpose of including SFM concepts in the project design is to make the forest valuable for the landowner even after the end of the crediting period. Ensuring that the landowner has a direct interest in maintaining and sustainably managing the forest beyond the scope of carbon credit revenues, also safeguards related biodiversity benefits in the long term (such as habitat for forest species, tree species richness, ecosystem services benefits and others).

Furthermore, the proposed activity aims to establish long-lasting stakeholder networks and partnerships beyond the project boundaries. Education on planting techniques and technologies, as well as sharing knowledge regarding sustainable land use and revenue models is permanent for the receivers and can potentially contribute to the creation of a restoration movement in the region.

### 2.1.20 Financial Sustainability (G1.12)

At this moment the Serra do Sudeste Grouped project is financed with impact investors and the future sales of carbon credits. The upfront finance is done by the investors and annual costs are covered with the sale of ERPA contracts. The Green Branch is in contact with large investors and corporate offtakes that ensure the financial sustainability of the projects. The current movements in the market and establishment of article 6 made it easier to get these commitments from investors and buyers. The financial sustainability is one of the main focus points and responsibilities of The Green Branch.

The project proponents' internal governance is led by Jacob Hietink, Rein Vehmeijer and Reinier Hietink. They are supported by the following external partners:

- Yuki: accountancy bureau
- Marco Kraaikamp: administrator
- PwC: tax and structure
- Feijo Lopes: tax & Brazilian law
- Barend post advocatuur: Dutch law

The Financial sustainability for landowners is secured as The Green Branch signs a long-term lease contract of a minimum of 30 years with the landowner. The payment structure is divided into a fixed and variable payment. The fixed payment is based on the income of other land uses and slightly outperforms cattle farming and clean rental prices. The variable part is performance based to create an incentive and a participation in market mechanisms and returns.

We take our local presence very seriously and therefore add multiple activities that create value to the local community and our projects. We have a local employee who is responsible for the community-based projects and has activities already up and running or in planning to stimulate the local community.

Our governance practices:

- Stakeholders are paid first
- Refinancing possibilities
- Retainers for shocks and future (anticipated) costs

### 2.1.21 Grouped Projects

#### 1) Eligibility Criteria for Grouped Projects (G1.14)

The following eligibility criteria apply for the inclusion of new project instances to the grouped project Serra do Sudeste:

- The new project is located within the boundaries of the grouped project zone, defined by the borders of the Pampa biome in the south of Brazil.
- There was no deforestation of native forest in the new project area within 10 years prior to the project start date of the new project instance.
- The project will not convert well-preserved and productive native grasslands into forests.
- The new project instance demonstrates compliance with the applicability criteria of the applied methodology AR-ACM0003 and its related tools, as described in chapter 3.1.2 “Applicability of Methodology”.
- The new project area is subject to the baseline and shows additionality as analysed for this grouped project.
- The new project is subject to the same community and biodiversity without-project scenarios as defined for the grouped project.
- Stakeholder engagement shall follow the processes as indicated in topics 2.3 for the grouped project.
- The project activities shall increase the carbon stock within the project implementation area by increasing the forest cover. Techniques are covering active planting of seeds and/or seedlings and assisted natural regeneration.
- Monitoring of the project areas shall be included in the monitoring plans of the grouped project.
- The project start date of new instances shall be at the same time or after the grouped project start date.

#### 2) Scalability Limits for the Grouped Projects (G1.15)

Scalability for the grouped project is restricted within the project boundaries (Section 2.1.7), and eligibility criteria (see above). The Green Branch is the owner of the projects and responsible for designing

the ARR activities. All project instances should include measures for mitigation of non-permanence risks. There are no limits related to:

- Finance: project financing can be scaled to reach the scalability objective.
- Capacity: The Green Branch is a rapidly expanding company of ARR professionals with backgrounds that cover all aspects of the operations: technical, managerial, financial, communication & marketing. In addition, the company has an established network in the region and there are enough local planting teams for the implementation of forestation activities.
- Design: there is capacity to design multifunctional projects that focus on restoration and at the same time look into land use diversification and project longevity beyond the crediting period.
- Materials: Using the established network in the region, no scalability limits are expected related to insufficient materials and resources.

**3) Risk Mitigation Approach for Grouped Projects (G1.15)**

The project does not aim to extend beyond defined limits. Scalability limits do not apply. Within limits, the grouped project will include only properties that meet the defined eligibility criteria and belong to landowners that share the project's vision and show commitment to related (climate, community, biodiversity) objectives.

## 2.2 Without-project Land Use Scenario and Additionality

### 2.2.1 Land Use Scenarios without the Project (G2.1)

The conditions prior to project initiation are represented by the alternative land use scenarios analysed in chapter 3.1.4 "Baseline Scenario & Demonstration of additionality".

### 2.2.2 Most-Likely Scenario Justification (G2.1)

As described in the baseline scenario analysis, the most likely land use scenario in the project region is a cattle pasture system. 34,8% of the project zone is grassland, which is primarily used for grazing livestock. It represents a traditional and widespread form of land management in the South of Rio Grande do Sul and does not face any significant barriers. The first project instance, Fazenda Silêncio, was also subject to livestock grazing prior to the implementation of the afforestation project.

### 2.2.3 Community and Biodiversity Additionality (G2.2)

The without-project scenario is subject to overgrazing and slash-and-burn practices to clear land for livestock grazing (see chapter 3.1.4 'Baseline Scenario & Demonstration of additionality'). Ultimately, this results in degraded soils, limiting woody species diversity mostly to pioneer shrubs. It also results in reduced ecological values and the capacity of the landscape to provide critical ecosystem services such as habitat connectivity, erosion control and water regulation.

Regarding the impact of the without-project scenario on the community of the project region, cattle ranching only provides limited job opportunities, as it is mostly led as family-business with a *Gaucho* (cowboy from the South American pampas) managing the cattle herds. Such limitations trap rural people in a vicious cycle of land degradation and restricts their capacity to transition to more sustainable land management practices.

The workforce from our local implementation partners used to work in watermelon crops, acacia, eucalyptus or pine forest plantations. These job opportunities decreased in past years. This is because farmers are giving up on planting watermelon due to concerns about the climate, and silviculture in the region has been facing institutional and social barriers. Other forestation activities, such as commercial plantations, were able to establish in the region due to subsidies and tax incentives over the past decades in an attempt to diversify the primary production sector of the state. In terms of additionality, job opportunities of the project provide a more attractive salary than the most typical alternative employment options. Moreover, the workforce from our local implementation partner agrees TGB treatment is better. Other employees do not provide lunch, snacks and a good way of treating people as the foreign company TGB gives. In addition to community benefits, in the absence of the project the development of a supply chain of forest related products and services would not occur.

Implementing the proposed ARR project will increase fauna and flora biodiversity by planting native tree species in degraded areas and create habitats for wildlife dependent on forest corridors. Furthermore, it creates an alternative source of income for landowners and offers opportunities for nature positive jobs under fair working conditions. These would have not occurred in the without-project scenario.

The Priority Conservation Areas that exist within the project boundaries are used as a policy instrument for prioritisation and do not restrict human activity. Thus, there would not be any nature-positive intervention directly on the ground in the form of a scalable grouped project using afforestation and reforestation with native trees.

ARR projects with the prior goal to create climate, biodiversity and community benefits are not common in the project region. The carbon native forest as described in the current document is the first in the area of interest, and so are its community and biodiversity outcomes.

Such projects do not target any established markets such as trading timber that is grown in Eucalyptus monoculture plantations. There are no subsidies or supportive regulations to establish carbon projects, making it a pioneer project serving the emerging emission removal market. A complete barrier analysis that would prevent project activities from being implemented in the absence of the project is provided in Step 2: Barrier analysis in chapter 3.1.4 “Baseline & Demonstration of additionality”.

### 2.2.4 Benefits to be used as Offsets (G2.2)

At the time of the grouped project start date, there are no intentions to use biodiversity and/or community benefits as offsets.

## 2.3 Stakeholder Engagement

### 2.3.1 Stakeholder Access to Project Documents (G3.1)

The project documents will be available on the website of VERRA. We were and still are continuously in contact with stakeholders to get feedback from them during project development. Any information regarding the project required by the stakeholders will be promptly sent.

### 2.3.2 Dissemination of Summary Project Documents (G3.1)

The summary project documentation, including description and monitoring results, will be actively disseminated to the local people by the Brazilian technical team and the Dutch project proponent that speaks portuguese. The team will explain the audit process and inform communities and stakeholders of upcoming auditor visits. Summary project documents will also be available on the VERRA registry.

### 2.3.3 Informational Meetings with Stakeholders (G3.1)

The Green Branch conducts a variety of informational meetings with community representatives and local stakeholders. During the Rapid Rural Appraisal survey, the project proponent collected feedback and suggestions, and asked the interviewed about predicted risks, benefits and impacts of the project.

Meetings with official entities, such as URCAMP, EMATER, SEMAPA, SEMA and EMBRAPA, are set up via email or phone calls. The meetings are held in person at the institutional offices or through virtual Google Meet meetings.

Meetings with local landowners are arranged in advance through phone calls and WhatsApp messages, or arrangements made by the cattle broker.

Staff meetings between the project proponent and the workers are held in person.

### 2.3.4 Community Costs, Risks, and Benefits (G3.2)

The objective of the project relating to Community is to improve the socio-economic conditions of the local people and to raise environmental awareness. The Rapid Rural Appraisal method was applied to a representative of the communities and local stakeholders. Surveys took place in between October, 2021 and February, 2022. They were asked about possible costs, risks and benefits of the project. No cost and risk were identified. Several informational meetings occurred with possible landowners and representatives of the supply chain.

### 2.3.5 Information to Stakeholders on Validation and Verification Process (G3.3)

Relevant stakeholders will receive the link to the CCB and VCS documentation in the Verra Registry. The Green Branch is always available via email for stakeholder representatives to provide information about project updates and discuss the progress. Furthermore, the quarterly newsletter of The Green Branch is sent to stakeholder representatives to keep them well informed about our projects and company activities.

### 2.3.6 Site Visit Information and Opportunities to Communicate with Auditor (G3.3)

The date of field visits will be communicated to communities and other stakeholders' representatives by e-mail and will be announced in the social media (Instagram, Facebook, LinkedIn) pages and website of the project proponent.

The email contact of representatives of the community groups and stakeholders can be asked for by the auditor of the validation and verification bodies and vice-versa, so direct and independent communication without any supervision by the proponent can take place.

### 2.3.7 Stakeholder Consultations (G3.4)

Community Groups and Other Stakeholders have influenced project design and implementation.

- Representatives of the proponent came to Brazil for the first time in 2020. Formal meetings with landowners were held to begin the conceptualization of the project and discussion about area selection. It is important to mention that two dutch representatives of the project proponent speak the local language, portuguese. Meetings were organized via local brokers.
- The species selection was made by the project proponent together with inputs received from Rodrigo Kanaan, biologist of SEMAPA, and head of a local cooperative running a nursery with focus on native tree species. The SEMAPA is the Municipal Secretariat for the Environment and Protection of the Pampa biome (*Secretaria Municipal do Meio Ambiente e Proteção do Bioma Pampa,* in Portuguese).
- The decisions on the project design came by brainstorming sessions with farmers and local people. The project implementation techniques were planned by agricultural and florestal engineers of the proponent together with the local workers.

### 2.3.8 Continued Consultation and Adaptive Management (G3.4)

Throughout the project lifetime, the project proponent, through its Brazilian team and its Dutch Portuguese-speaking members, will maintain a direct line of communication with community members and relevant project stakeholders. The stakeholders were informed that they are free to contact TGB, to visit the area, to give feedback and to request information about the project at any time. TGB respects the local customs, values and institutions.

The communication will take place in previously specified and regular frequencies, as for collecting data for the Community Monitoring Plan, and in more punctual and on-demand frequencies. The Brazilian project manager in the field maintains regular communication and consultation with local community members and stakeholders through face-to-face meetings (Figure 5). Formal meetings with the community group of workers will take place every 15 days during project implementation. The project proponent has an adaptive management plan (Silvicultural approach) which continuously is adapted through project monitoring, evaluation, and feedback from society.

*Figure 5: Stakeholder meetings*

### 2.3.9 Stakeholder Consultation Channels (G3.5)

All consultations and participatory processes have been undertaken directly with communities and other stakeholders. Information about the carbon market, ARR activities, plant selection, and research and partnership opportunities were shared and discussed. TGB has used the consultation channels below:

- In person meetings held in Portuguese, either at the TGB local office or at the stakeholder's office;
- WhatsApp with local farmers, workers, suppliers and university professors;
- Phone calls and video conferences via Google Meet;
- Announcements of TGB accomplishments via LinkedIn and Instagram.

### 2.3.10 Stakeholder Participation in Decision-Making and Implementation (G3.6)

TGB technical team includes two local professionals, both from Bagé. They are in frequent communication with local stakeholders, as representatives of government departments and nursery employees. In the meetings, along with information spreading, individuals are informed that their participation and inputs are very valuable.

In the project planning phase, stakeholders were involved in the species selection, planting design and planting techniques selection through RRA surveys. During the project implementation, the local community group of workers will be the direct implementers of the project, and the local engineer will act as the coordinator who is in charge of the overall management of the dutch project. As mentioned in 2.3.8, our management plan is open to receive critical reviews and comments regarding decision-making at any time.

During the implementation phase, leaders of the team workers will be connected with the TGB technical team through mobile devices, so on time communication is possible. TGB encourages the active participation of employees in decision-making.

### 2.3.11 Anti-Discrimination Assurance (G3.7)

Since its first visit in Brazil, the project proponent included community members as collaboratives to determine culturally appropriate methods for behaving and so expand in a proper and inclusive manner, ensuring no form of gender, cultural or religion discrimination. Furthermore, the project proponent obey the national laws and is supported by local lawyers, guaranteing that no type of discrimination at any point of the project development. Finally, the project proponent has a policy in place, targeted at dealing with discrimination phenomena in its operations. The 'TGB Harassment & Bullying Policy is included in the list of supportive documents.

### 2.3.12 Feedback and Grievance Redress Procedure (G3.8)

The process for receiving, assessing, and resolving stakeholder grievance at TGB is as follows:

1. **Receive grievance**

Any employee of TGB receiving a grievance should record details such as a summary of the grievance, involved parties, the date, and the contact details of the person filing the grievance. The information will then be forwarded in written form to the grievance officers of TGB, currently represented by its co-founders.

2. **Record**

The grievance officers are responsible for maintaining a detailed record of the grievance investigation and interaction with affected internal and external stakeholders.

3. **Screen**

The grievance is screened and, depending on the level of severity, categorised into one of the 3 stages of grievance:

Stage 1: Internal attempt of resolution

An answer to the grievance can be provided internally by the grievance officer without the need of external consultation.

Stage 2: Mediation

A third-party mediation is necessary to solve the conflict. If needed, a legal advisor will be involved in the mediation process, collecting all necessary documentation from TGB to present to the mediator and communicating on behalf of TGB the preferred solution for the grievance case.

Stage 3: Arbitration or Court

In case the mediation process does most likely not lead to a satisfactory settlement for TGB, the grievance case will be taken to the court. Again, a legal counsel will represent the interests of TGB.

**4. Acknowledge**

A grievance officer will contact the stakeholder within 10 business days after receiving the grievance by providing a formal acknowledgement, a summary of the case as well as an outline of the process, including an expected timeline. Contact will preferably be established per email, if that is not possible the stakeholder will be reached out to via phone.

**5. Investigate & Act**

The grievance officer is responsible for extensive investigation of the grievance, including consulting involved employees and/or external stakeholders, site visits and other potentially necessary actions to gain holistic understanding of the case. A detailed record of activities is essential to allow for in-depth analysis and subsequent planning of steps to resolve the case. The grievance officer is responsible for transparently communicating the developed plan to all affected parties, monitoring the actions taken, and meeting deadlines. When all steps have been completed and a resolution has been reached that is satisfactory to both the complainant and TGB, the case will be closed with written documentation of the resolution signed by both parties.

Possible Outcomes of step 5:

- Successful resolution
- Appeal (following another round of Investigation & Acting

**6. Follow up and close out**

The grievance officer will contact the involved parties 3-6 weeks after the case was closed and ask for feedback on the process, which will be reflected upon internally by the grievance officer to improve future handling of grievance procedures. All documentation of the grievance case will be stored for at least 3 years.

### 2.3.13 Accessibility of the Feedback and Grievance Redress Procedure (G3.8)

Protocols of the grievance process are available upon request. All relevant documents of the conflict resolution are managed and stored by the grievance officers.

### 2.3.14 Worker Training (G3.9)

The technical team will provide training for the workers the week before the start of the implementation phase. The training and working plan have the approval of an external safety consultant. Training includes the clarification of tree planting methods, monitoring procedures, the use of GPS and other technologies. Training also includes orientation on how to proceed when natural hazard occurs (e.g., snakes) and fires, and how to avoid them.

### 2.3.15 Community Employment Opportunities (G3.10)

TGB advocates equal opportunities for all local workers, given an equal opportunity without any discrimination of age, gender, marital status, ethnicity, social status or religious convictions, political ideas or sexual orientation.

The operational employees usually have seasonal job opportunities, as explained in 4.1.1. For all the providers of this type of service in the region, the company has requested interest, availability and budget.

A program is being designed where female community members will have a key role in the supply chain of seeds and seedlings, the agroforestry plot management and non-timber forest product exploitation.

The technical employees were hired according to the vacant position, based on skill sets without any discrimination. There is one local man and one local woman on the technical team. He is the field coordinator who is in charge of the overall management and she works directly with the team in the Netherlands for collecting data and expanding the local network.

### 2.3.16 Relevant Laws and Regulations Related to Workers Rights (G3.11)

The structure of labor law in Brazil is based on the following: Federal Constitution > "CLT" (Brazilian Labor Code) and Sparse Employment Legislation > Collective Bargaining Agreement > Employment Agreement.

With the Labor Reform (occurred in 2017), the bargaining agreement, in some matters, shall prevail over the legislation, more specifically, over sparse employment legislation and CLT. In the case of "hyper sufficient employee"[11], the employment agreement shall prevail over the legislation.

Relevant laws and regulations

- Federal Constitution, article 7: provides for fundamental labor rights;
- Decree-law n. 5.452/1943 – "CLT" (Brazilian Labor Code): provides for the rules that regulate individual and collective labor relations;
- Sparse Employment Legislation: there are many sparse laws in labor area, the following list includes relevant examples:
    - Law n. 5.889/1973 (rural work);
    - Law n. 6.019/1974 (temporary job);
    - Law n. 13.429/2017 (outsourcing);
    - Law n. 12.506/2011 (previous notice);
    - Law n. 7.418/1985 (transportation allowance);
    - Law n. 10.101/2000 (profit sharing);

[11] Pursuant to sole paragraph of article 444 of CLT an employee can be deemed hyper sufficient when: (i) has a graduate degree; (ii) and has a monthly compensation equivalent or higher than R$ 14,000.00 (approximately).

- Regulation from Labor Ministry ("Normas Regulamentadoras – NRs"): regulate mandatory procedures to ensure health and safety conditions in the work environment. There are thirty-five NRs, of which we highlight the following:
    - NR-6: regulates the safety equipment to be provided for the workers;
    - NR-12: sets forth machinery and equipment safety;
    - NR-15, NR-16, NR-19 e NR-20: defines unhealthy and hazardous work conditions;
    - NR-17: provides for ergonomics.

Assurance that the project meets or exceeds laws and regulations concerning worker's rights

The company doesn't have direct employees in Brazil.

The labour outsourcing contracts signed with local service providing companies set forth outsourced company's labour obligations, such as the correct payment of the wages and social security of their employees; compliance to labour legislation and regulation; the presentation of the workers' pay checks and regularisation before the National Social Security Institute ("Instituto Nacional de Seguridade Social – INSS"); the supply of safety equipment for the workers (Individual Protection Equipment); the training of the workers in the correct use of safety equipment, and supervision of the use of such equipment.

The Green Branch intends to elaborate a new and revised compliance policy for the company to be presented and entered into by partner companies, setting forth obligations and providing sanctions in case of violation, specially concerning social responsibility.

Measures needed and designed to inform workers about their rights

The workers can rely on their Union to find out about their rights. As said, The Green Branch doesn't have direct employees in Brazil, but the outsourced companies can also provide that information to the workers.

Specifically, regarding health and safety conditions in the work environment, TGB will use posters with safety information in the workplace.

### 2.3.17 Occupational Safety Assessment (G3.12)

On the first day of planting, we have an external safety consultant to inform workers of risks and how to minimize them. The external team will give a seminar on safety and first aid. They check all the buildings, machines, and equipment to assess the risk and prepare an independent report.

The technical security person has written a risk management program specific to the workers' activities. It includes recognition and assessment of production risks (e.g. hoe, concrete mixer, tractor, sander, kitchen) and environmental risks (physical, chemical, accident mechanical, biological and ergonomic agents) and risk prevention or reduction measures.

The risks will be minimized through the provision of protective gear (personal protection equipment), first aid boxes for every building, tractor, and for each field team. Workers are oriented on how to utilize the handling tools, to remain seated in the vehicles that transport them and to drive at low speed. They receive medicine for sore throats, muscle pain and additional vitamins.

## 2.4 Management Capacity

### 2.4.1 Project Governance Structures (G4.1)

Figure 6 below shows the organisational structure of TGB, including the company and key stakeholders. The chart describes the roles of and relationships between the involved entities to ensure a successful project acquisition, implementation, and management.

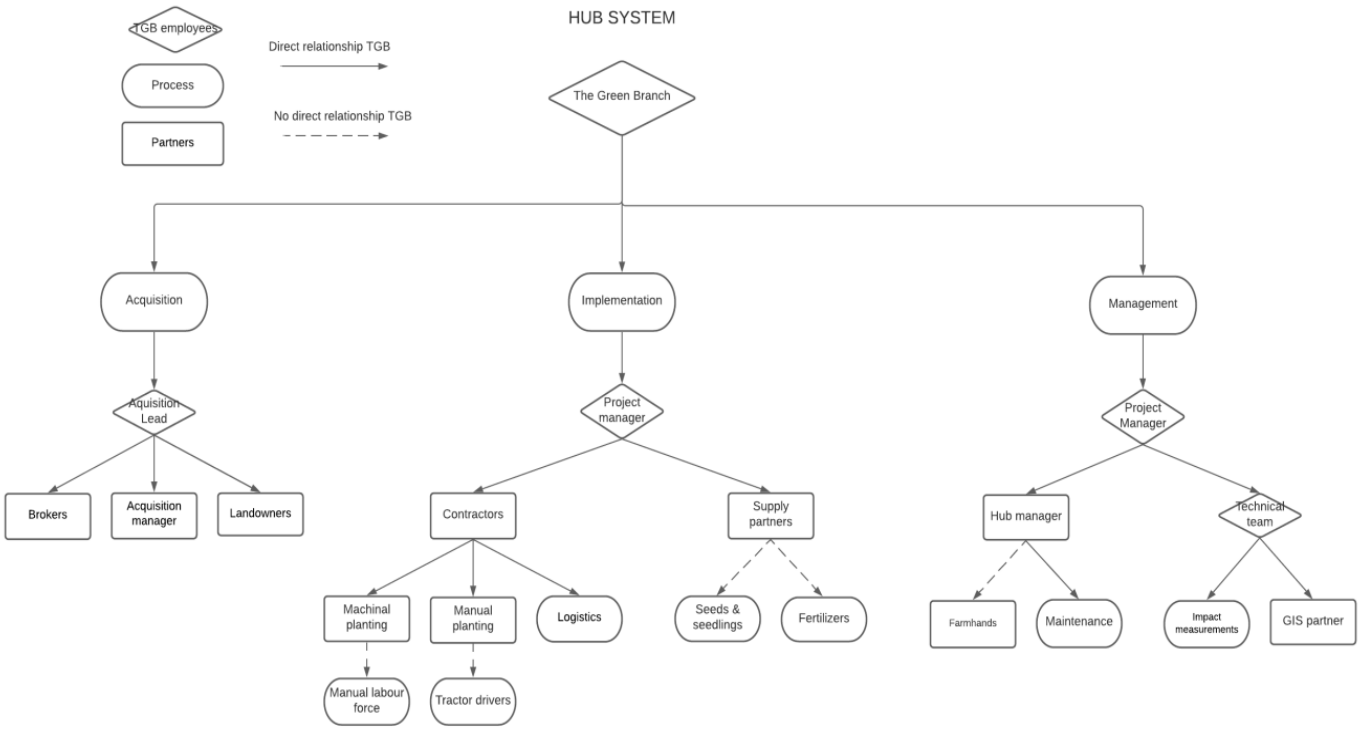


*Figure 6: Organisational chart of TGB*

In order to design a planting approach according to our philosophy of multi-functional forest restoration, TGB has partnered up with a Brazilian agroforestry consultancy. Their involvement in the project relates to designing the planting approach and schedule, selecting the most appropriate and suitable species for the project, analysing the project side with drone and satellite imagery to determine feasibility and potential, creating maps of the area, and determining input needs. With his experience, TGB aims to design the planting approach in an optimal way, which integrates ecology, agronomy and forestry.

### 2.4.2 Required Technical Skills (G4.2)

In order to successfully implement the project and properly carry out project activities, a range of technical skills are required. Specifically, the technical needs of the project include skills and knowledge in the following fields:

**Carbon estimations and accounting:** establishing baselines, determining carbon profile, estimating carbon uptake and performing carbon accounting, storing/ collecting/ analysing data, reporting.

**Biodiversity assessment & monitoring:** establishing baselines, determining biodiversity impacts, developing biodiversity objectives, selecting indicators, designing monitoring programmes, storing/ collecting/ analysing data, reporting.

**Community engagement & stakeholder identification:** establishing baselines, determining impacts on communities, engaging with communities and stakeholders, awareness of local community context, developing community objectives, selecting indicators, designing monitoring programmes, storing/ collecting/ analysing data, reporting.

**Forestation project design:** knowledge in planting techniques, selection of suitable species, site preparation, determination of input needs.

**Equipment and maintenance:** provide necessary equipment, arrange repairs and other interventions for maintenance.

**Project implementation:** develop implementation schedule, plan and arrange logistics, resource & material management, monitor track implementation progress, report results.

**Legal requirement compliance and documentation:** ensure compliance with legal requirements, analyse applicable legislation and land ownership evidence, develop legal documentation of the project.

### 2.4.3 Management Team Experience (G4.2)

TGB is a rapidly expanding company and has adequate staffing to meet the grouped project objectives. Furthermore, TGB has permanent personnel in the Netherlands as well as collaborators in Brazil, where the project is implemented. The project proponent employs a mix of professionals from Europe and Brazil, RS specifically, to ensure that all aspects of project management are met. The following

Table 8 includes all members of the management team and their respective experience and roles.

*Table 8: Management Team TGB*

| Role in TGB Management Team | Experience |
|---|---|
| Financial manager | The financial department is led by the two directors of the green branch, both studied at one of the most well-known finance schools of Europe. The finance department is supported by two advisors that work on a part time basis. |
| Governance manager | Governance is led by a global executive with strong strategic, business, financial & operational acumen with experience in highly complex, fast paced & global environments. He has demonstrated excellent leadership with a successful track record of delivering results and demonstrated success in leading, managing and<br>developing multicultural teams. Known as a strong relationship builder he is involving the best people in critical projects and balancing competing priorities. |
| Carbon Specialist | Experience in forestry carbon accounting with practical experience in the context of the Atlantic Forest in Brazil. Engagement in forest management concepts from an early age. |
| Ecosystem Services & Biodiversity Specialist | Experienced consultant in biodiversity and ecosystem services, with demonstrated experience in research project and reporting, ecological data management and interpretation and relevant project development. Works in biodiversity impact design & monitoring. |
| Community Engagement & Project Coordinator | PhD candidate in integrated systems, experience in environmental and community research, familiarity with the local community context. Works in data collection, community engagement, impact design & monitoring. |
| Project Coordinator | Expert in holistic agroecological management, livestock control, regenerative agriculture with more than 10 years of experience in the forestry sector. Works in planting design, implementation and post implementation management. |

| | |
|---|---|
| Hub Manager | Local professional with more than 30 years of rural experience. Manage and oversee hub operations, arrange equipment, perform maintenance and repair work. |
| External Consultant | Forest Engineer and Agronomist (MSc. ESALQ-USP) with 30+ years of experience in forestry projects. Works in forestation activity design and implementation. |
| Contracted Legal Office based in Porto Alegre, RS. | Ranked one of Brazil's best law firms with long experience in legal compliance and documentation. |

### 2.4.4 Project Management Partnerships/Team Development (G4.2)

The project proponent has all the capacity and knowledge required to design a planting approach according to our philosophy of multi-functional forest restoration. However, in order to bring in regional experience and to have an external opinion on project aspects, the project proponent is in collaboration with local partners such as nurseries, universities and a local agroforestry consultancy. The nursery is experienced in conservation projects involving native tree species in the project region, whereas the university provides input from an academic viewpoint and researches seed and seedling survival rates. The consultancy partner has an exceptional track record in Brazil and offers a wide range of engineering services in various fields including forestry, surveying, environmental and agronomy, georeferencing mapping aerial surveys with drones, photo-interpretation, recommendations for sustainable land use, soil and road conservation and forest inventory. Their staff is highly qualified and experienced and has been involved in numerous related projects around the country. In collaboration with our partners knowledge and experience, TGB aims to design the planting approach in an optimal way, which integrates ecology, agronomy and forestry.

### 2.4.5 Financial Health of Implementing Organization(s) (G4.3)

The project proponent has the financial vigour to ensure sufficient financial resources over the project's lifetime. Project has secured from investors 80% or more of funding needed to cover the total cash out before the project reaches breakeven. Before the project implementation starts, more than 118% of the total cash out has been funded. Furthermore, from the current risk assessment, project cash flow breakeven point is less than 4 years. There is no time in the project where there is a negative cash flow, ensuring financial stability.

Furthermore, The Grouped Project has its own legal entity to allow good governance and protect it against intoxication dangers and liabilities from other projects.

Company financial audits and statements will be provided to the project's independent VVB upon request. For further information, see section 2.1.20 Financial Sustainability.

### 2.4.6 Avoidance of Corruption and Other Unethical Behavior (G4.3)

The Green Branch B.V. and other project entities are not involved in any form of corruption. TGB rejects any form of corruption (including bribery, embezzlement, fraud, favoritism, cronyism, nepotism, extortion, and collusion) and has an established policy against such phenomena. As described in the 'TGB Anti-bribery Policy' (included in the supporting documents), the company '*is fully committed to instilling a strong anti-corruption culture and is fully committed to compliance with all anti-bribery and anti-corruption legislation including, but not limited to, the Bribery Act 2010 ("the Act") and ensures that no bribes or other corrupt payments, inducements or similar are made, offered, sought or obtained by us or anyone working on our behalf*.'

In addition to the Anti-bribery policy, the project proponent has a Fair-Trade Policy also in place. The 'TGB Fair Trade Policy' aims to '*ensure that every product we supply is [sourced] [and] [produced] [and] [obtained] in accordance with our fair-trade policy and those ethical standards, in an acceptable manner, in accordance with current best practices, and in particular lawfully, through fair and honest dealing, without exploiting the people who made the products, in decent working conditions, and with environmental impact during production and transportation being reduced'*. Both policy documents are included in the list of supporting documents.

Furthermore, TGB is a certified B-Corp which are 'businesses that meet high standards of verified performance, accountability, and transparency on factors from employee benefits and charitable giving to supply chain practices and input materials' (B Lab, 2022). Certifications awarded by all three independent bodies of B-Corp, VCS & CCB (accompanied by all relevant documentation and internal policies) shall provide unambiguous assurance of corruption (and other unethical behaviour) avoidance.

### 2.4.7 Commercially Sensitive Information (*Rules* 3.5.13 – 3.5.14)

No commercially sensitive information has been excluded from the public versions of the project documents.

## 2.5 Legal Status and Property Rights

### 2.5.1 Statutory and Customary Property Rights (G5.1)

All lands listed as grouped project instances are exclusively owned by private individuals (landowners), which is priorly verified through the conduction of a due diligence both on the land slot as well as on its owner(s). The due diligence procedure allows TGB to ascertain the need to formalize other agreements, such as, but not limited to a fiduciary lien, to assure TGB's usage rights continuity over the project period. Once the due diligence is satisfyingly concluded, according to TGB's criteria, landowners enter into an official agreement with TGB (as a project proponent) for implementing the ARR project and grant complete access/use rights to carry out project activities. This is the case for the first grouped project instance (Fazenda Silêncio), and subsequent instances that will be enlisted under the grouped project will do so following the same approach.

The project area and the project instance properties are all mapped in GIS. For every grouped project instance, the Rural Environmental Registry (CAR) proof is provided by the landowners, referred to

in the formal agreement with TGB and then added to the related project documentation. The latter is an unambiguous land ownership document that can determine an appropriate level of property rights for the implementation of the grouped ARR project activities. Furthermore, the agreement between TGB and the landowner is registered before the Real Estate Registry ("*Cartório de Registro de Imóveis*") of the land site's location thus providing the agreement with publicity before third parties. Therefore, the project proponent declares that no ownership rights, third party rights nor any land access/use legislation will be violated for implementing project activities.

All the evidence, including geospatial data and ownership documentation, are available for the validation process.

### 2.5.2 Recognition of Property Rights (G5.1)

All sites selected for grouped ARR project activities are privately owned properties and all relevant rights are recognised and respected once TGB enters into a lease agreement with landowners that can present verified proof of ownership and property rights. The agreement is only entered into by TGB if the landowner can provide sufficient proof of ownership over the land site, as well as demonstrate the inexistence of liens, restrictions, legal impediments, third party rights or any other rights that might grant the landowner full title over the land. During the due diligence conducted by TGB on the land site and on its owner(s), ownership and property rights are demonstrated and verified through the SICAR (Sistema Nacional de Cadastro Ambiental Rural) registration in the Rural Environmental Registry (CAR). Created by Law nº 12.651/2012, within the scope of the National Environmental Information System - SINIMA, and regulated by Normative Instruction MMA nº 2 of May 5, 2014, the Rural Environmental Registry - CAR is an electronic public record of national scope, mandatory for all rural properties, in order to integrate environmental information from rural properties and possessions.

Enrolment in the CAR is the first step towards obtaining the environmental regularity of the property, and includes: data on the owner, rural possessor or directly responsible for the rural property; data on documents proving ownership and/or possession; and georeferenced information on the property's perimeter, areas of social interest and areas of public utility, with information on the location of remnants of native vegetation, Permanent Preservation Areas ("*Áreas de Proteção Permanente – APP*"), Restricted Use areas ("*Áreas de Uso Restrito*"), consolidated areas and Legal Reserves ("*Reservas Legais*") (Serviço Florestal Brasileiro, 2022). Authenticity and good order of CAR record and other documentation related to property rights is checked by TGB and its legal partners (Feijó Lopes Advogados Law Firm).

### 2.5.3 Free, Prior and Informed Consent (G5.2)

All private landowners enter into a lease agreement with the Project Proponent based on a decision taken freely by them, according to their own interest in partaking in the ARR project and being compensated as proposed by TGB and negotiated between the parties. The lease agreement for conducting the ARR activities is a formal, official, lawfully registered agreement, abiding to all applicable national and local legislation and it is thus legally binding for both parties. Current projects' area in the state of Rio Grande do Sul, as well as other prospected project areas, are highly invested into by the agribusiness market, with several large estates dedicated to cattle raising and grain cultures. Therefore, local landowners are extremely familiar with leasing, purchasing, and selling land in the region. They have an advanced

understanding of the related market and vast experience with agro pastoral deals, including knowledge around its various aspects such as resource rent and opportunity costs for different land uses, additional revenues and costs, legal constraints and opportunities etc.

For this reason, the decision to join, or not to join, the ARR project is taken on a completely and absolutely informed and willingly basis. Furthermore, written consent for granting access and management rights to the project proponent must occur prior to the initiation of any activities related to the project, which is done in an official, written and signed form being said consent inserted in the agreement entered into by TGB and the landowners. It is thus obligatory that consent is given prior to the initiation of any individual project instance activities. Finally, all the information related to the project is presented to landowners before the signing of any legally binding documents. Full and complete information is given to the landowners priorly to the signature of a non-legally binding MoU concerning project activities (forestation design and implementation, planting approach and techniques applied, species selection, schedule etc), rent payments and their arrangement schedule, project duration, project benefits and other issues. Information which is then used by landowners to negotiate the project's conditions with TGB and thereafter make the decision to enter the agreement.

Property rights and clearly defined boundaries are verified through the official CAR registry of Brazil and owners enter the binding lease agreement giving their free, prior and informed consent to the entirety of the project's conditions. As compensation for the usage of their land, landowners receive rent payments on a yearly basis, according to what was negotiated between the parties.

As a result, legal measures are taken by TGB to ensure that the project cannot encroach uninvited on private property, community property, or government property and that appropriate restitution or compensation has been allocated to any parties whose lands have been or will be affected by the project.

### 2.5.4 Property Rights Protection (G5.3)

As demonstrated in the sections above, project activities are taking place on properties owned by private landowners through a transparent process that results in a mutual agreement in the form of a legally binding contract that has an exclusively commercial aspect. Furthermore, the economical exploration of the land by landowners is their main activity related to their property rights, thus TGB activities fall in line with the destination that would have otherwise been given to the land by the landowners. Project activities do not lead to involuntary removal or relocation of property rights holders from their lands or territories and does not force rights holders to relocate activities important to their culture or livelihood. There has thus been no need for compensation in that matter.

### 2.5.5 Illegal Activity Identification (G5.4)

Two illegal activities that could potentially affect the project's impacts have been identified: fire and grazing. The use of fire in agriculture is not entirely prohibited but legislation (Forest Code, article 38 of Law number 12,651/12) requires that it is strictly regulated. However, the general observation from the region suggests that applying fire does not always imply acquisition of the relevant permit granted by authorities. Simultaneously, it is also common for cattle ranchers to release animals towards areas over which they do not have property or use rights.

Potentially, frequent occurrence of these illegal activities could compromise the project's climate, community, and biodiversity benefits, which could then diminish the project's performance even though it would not, on the other hand, make it so the project's benefits derive from said illegal activities. Notwithstanding, to mitigate such risks, a systematic control and intervention plan has been designed and will be enacted as part of project monitoring and maintenance activities. Fire occurrence will be monitored together with the implementation of a fire response and management plan. The same applies for grazing monitoring and associated intervention measures (such as repairing broken fences and resolving disputes with neighboring cattle ranchers). Every project site will be monitored in its entirety to ensure that illegal activities are being systematically monitored and all related interventions are recorded. The processes for doing so, follow the guidance of TGB Adaptive Management Plan 2022 (included in the list of supporting documents).

### 2.5.6 Ongoing Disputes (G5.5)

To the best of both the project proponent's and landowners' knowledge, there are currently no ongoing or unresolved conflicts or disputes over rights to lands, territories and resources, which is previously verified through a due diligence procedure on the land site and its owner(s). If any ongoing or unresolved conflict or dispute over right to land, territories and resources turn out to be detected during the due diligence, a major red flag alert is raised and concerns might lead to legal counselling suggesting TGB waives on conducting the project in the area. Therefore, any activity undertaken by the project cannot prejudice the outcome of an unresolved dispute relevant to the project. Furthermore, there have not been any recorded disputes during the last 20 years. For any disputes that may arise in the future, the project proponent will enact the related policy that is in place, namely 'TGB Dispute Resolution Policy' in accordance with the ICC Mediation Rules.

### 2.5.7 National and Local Laws (G5.6)

TGB complies with all national and local laws, as extensively reviewed in Attachment "Environmental guidelines TGB". Legal compliance is handled by Feijó Lopes Advogados, a partner Law firm in Brazil who is very experienced with local and national legislation. The project proponent holds an overview of all applicable national, regional and local laws, statutes and regulatory frameworks in the host country that are relevant to the project activities. A list of all relevant legislation is submitted as an attachment in the Supporting documents.

Compliance is achieved and monitored by Feijó Lopes Advogados during pre-contractual stages of the projects, when preliminary documents, such as an MoU are negotiated, drafted, and signed and a due diligence is conducted to assess the legal scenario of both the project's site and its owners, ascertain any past, present, or future risks to the project's planning and execution and to outline the most effective legal measures to be used in TGB's protection. Feijó Lopes Advogados also provides legal counselling during the contractual and post-contractual stages of the projects by drafting and assisting in the negotiation of contractual conditions as well as providing TGB with legal advice on monitoring the project contract and any other related contracts execution.

### 2.5.8 Approvals (G5.7)

Brazilian law is not clear on carbon rights and Brazilian legislation does not regulate Carbon Credit rights of the landowners, project implementers and/or others, yet. Therefore, because there are no specific rules or statutes on Carbon Credits, currently, the Brazilian Carbon Credit sector operates exclusively on the voluntary Carbon Credit market.

Furthermore, there are no current restrictions regarding the ownership of contracted Carbon Credits, considering the absence of legislative regulation and the operations on the voluntary market. However, if the Bill 528/2021 that creates the Brazilian Market for Emissions Reduction (*Mercado Brasileiro de Redução de Emissões – MBRE*) is approved before Brazilian legislative, it will affect Carbon Credit deals made with small landowners (average land size of 80 hectares) by assuring these landowners 10% of Carbon Credits generated by their land. It should be noted that if the Brazilian Market for Emissions Reduction enters into force, Carbon Credit projects will have to comply with validation and certification of the National System of Registration of GHG Reduction and Offsets (*Sistema Nacional de Registro de Redução e Compensações de GEEs – SNRC-CGE*), as provided for in Bill 528/2021.

Notwithstanding, according to current Brazilian legislation, Native Forest plantation for Carbon Credit generation is exempt from any administrative permits, either by the landowners and/or Project implementer or any other third parties. Nonetheless, this exemption does not relieve the landowner and/or project implementer from: (i) obtaining the land's Rural Environmental Registration (*Cadastro Ambiental Rural – CAR*); and (ii) the requirement to maintain 20% of the property's area covered by native vegetation as a Legal Reserve, as well as to preserve the Permanent Preservation Areas (*Áreas de Preservação Permanente – APP*), which are subjected to inspection by the competent environmental agency.

The project has approval from the landowners, who can be deemed "*appropriate authorities*", according to the aforementioned. Approval of the project can be demonstrated via the signed lease agreement to implement the project (and perform related activities) between TGB and the landowners. Finally, the project is listed in the Real Estate Registry of the land site's location (*Registro de Imóveis*) which ensures publicity to the agreement and the rights and obligations contained thereto.

### 2.5.9 Project Ownership (G5.8)

TGB has rightful ownership of the project because of the following criteria, following the requirements of VCS specifications of the applied version, for which evidence shall be presented:

1. A right of use arising or granted under statute, regulation or decree by a competent authority.
2. Project ownership arising under law.
3. An enforceable and irrevocable agreement with the holder of the statutory, property or contractual right in the land, vegetation or conservation or management process that generates GHG (greenhouse gases) emission reductions or removals which vests project ownership in the project proponent.

Proof of ownership over the land involved in the projects is assessed during a Due Diligence, in which an analysis of public records and, eventually, judicial records is conducted. If there remains doubt or if proof of ownership is absent, a fiduciary assignment lying over a different real estate asset can be signed

with the landowner as collateral to a fine set forth in the Lease Agreement to assure TGB's long lasting right of usage over the land.

During the Due Diligence, the following documents are analysed:

1. Real Estate Registration;
2. Proof of Taxes payment (IPTU and ITR);
3. Fire Department Inspection Certificate – if applicable;
4. Occupancy Permit;
5. Operation Permit;
6. List of lawsuits, fines, penalties, administrative procedures, investigations and/or any other debts over the Real Estate's registration and regarding the Landowner and the Tenant (if applicable);
7. Environmental licenses or authorizations issued for activities on the property;
8. Water Grant – if applicable;
9. Rural Environmental Registration (*Cadastro Ambiental Rural*) – "CAR";
10. Permanent Protection Area (APP) and/or Legal Reserve status;
11. Environmental Infraction Notices – if applicable;
12. Federal Technical Registration – CTF/IBAMA;
13. Environmental Licenses;
14. Authorization for vegetation removal – if applicable;
15. Information about waste management;
16. RG, CPF and updated proof of address of the Landowner and/or the project implementer – if applicable;

The contract between TGB and the landowners: (i) Grants TGB the rights to be the project proponent and project implementer; (ii) Awards TGB the exclusive and rightful ownership over the carbon credits which are produced under the project activities; (iii) Concedes TGB the competency to access the project site at all times for the project activities; and (iv) Gives TGB all data, research and imagery needed for proper inspection and monitoring.

Furthermore, the contract between TGB and the landowners states that all certified carbon credits will be issued to the account of TGB and registered in its name who will negotiate the rights of these issued VCUs to the final beneficiaries. Finally, the contract sets forth that payments for these rights will follow the terms and conditions of this contract as set out in the Attachment.

### 2.5.10 Management of Double Counting Risk (G5.9)

Apart from the Verified Carbon Units (VCUs) (with Climate, Community & Biodiversity) issued under Verra's VCS and CCB Standards, the project does not seek additional certification or the acquisition of any form of other environmental or social credit, including any tradable climate (including but not limited to GHG-related or renewable energy certificates), community or biodiversity units. The current project is entirely independent of any other carbon project scheme and the emissions reduction or removal resulting from project activities will not be used for compliance under any other trading program or mechanism. Therefore, there is not, nor will be, any double counting occurring on the project benefits. Risk for double counting is also managed through the use of the Verra registry system.

### 2.5.11 Emissions Trading Programs and Other Binding Limits

GHG emission reductions and removals generated by the project will not be used for compliance under Emissions Trading Programs or mechanisms. As stated in the section 2.5.10, Carbon credits under VCU are the only environmental service credit being generated from the grouped project. No other environmental credits are planned to be generated or traded.

### 2.5.12 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

### 2.5.13 Participation under Other GHG Programs

The project has not been registered and is not seeking registration under any other GHG programs.

### 2.5.14 Projects Rejected by Other GHG Programs

The project has not sought registration under, and as a result has not been rejected by, any other GHG program.

### 2.5.15 Double Counting (G5.9)

See section 2.5.10.

# 3 CLIMATE

## 3.1 Application of Methodology

### 3.1.1 Title and Reference of Methodology

The grouped project Serra do Sudeste is a VCS AFOLU (Agriculture, Forestry and Other Lands Use) project (scope 14) and falls specifically under the ARR (Afforestation, Reforestation and Revegetation) category. The project goal is the afforestation and reforestation of degraded lands, which would continue to remain degraded, and would become increasingly more degraded in absence of the project. The project aims to restore natural biodiverse forest and produce incremental crops through agroforestry.

The title of the applied methodology AR-ACM0003 is "A/R Large-scale Consolidated Methodology Afforestation and reforestation of lands except wetlands - Version 02.0", as disclosed under the United Nations Convention on Climate Change CDM (Clean Development Mechanism) methodologies.

Extending the methodology mentioned above, this grouped project relies on the following tools:

- Clean development mechanism project standard;
- A/R methodological tools:
    - **AR-Tool 02: "**Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities" (Version 01);
    - **AR-Tool 03:** "Calculation of the number of sample plots for measurements within A/R CDM project activities" (Version 02.1.0);
    - **AR-Tool 08:** "Estimation of non-CO2 greenhouse gas (GHG) emissions resulting from burning of biomass attributable to an A/R CDM project activity" (Version 04.0.0);
    - **AR-Tool 12:** "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities" (Version 03.1);
    - **AR-Tool 14:** "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" (Version 04.2);
    - **AR-Tool 15:** "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity" (Version 02.0);
    - **AR-Tool 16:** "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities" (Version 01.1.0);
    - **AR-Tool 17:** "Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities" (Version 01.0.0).

### 3.1.2 Applicability of Methodology

AR-ACM0003

| Condition | Justification |
|---|---|
| The land subject to the project activity does not fall in wetland category; | The project site consists of agricultural land and regenerating shrubland and does not cover any wetlands, as evidenced by drone imagery made available for review by the VVB. The |

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|---|---|
| | area is located in the Pampa biome in the south of the state of Rio Grande do Sul, Brazil. Elevation at the first grouped project instance (Fazenda Silêncio) ranges between 196 and 348 metres above sea level. |
| Soil disturbance attributable to the project activity does not cover more than 10 percent of area in each of the following types of land, when these lands are<br>included within the project boundary:<br>(i) Land containing organic soils;<br>(ii) Land which, in the baseline, is subjected to land-use and management practices and receives inputs listed in appendices 1 and 2 to this<br>methodology. | Soil disturbance is kept to a level of max. 1,33% for manual planting (0.16m2 coves with a max. of 833 coves/ha) and max. 10% for mechanical planting (rows of 0.4m width every 4m). |

AR-Tool 02: Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities

| Condition | Justification |
|---|---|
| Forestation of the land within the proposed project boundary performed with or without being registered as the A/R CDM project activity shall not lead to violation of any applicable law even if<br>the law is not enforced. | The project is in compliance with applicable legal and regulatory requirements. TGB complies with all national and local laws, as extensively reviewed in the supplementary document “Environmental guidelines TGB”. Legal compliance is handled by Feijó Lopes Advogados, a partner Law firm in Brazil who is very experienced with local and national legislation. |
| This tool is not applicable to small - scale afforestation and reforestation project activities. | The first project instance of this grouped project (Fazenda Silêncio) will remove on average 14703,00 tCO2e. per year throughout the first 30 years after project implementation. Taking into account adding new project instances in the first years after the project start, the yearly removals over 30 years will exceed the threshold of 16.000 tCO2e per year. Thus, the |

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| | grouped project is classified as a large-scale project. (UNFCCC, 2013). |

AR-TOOL 03: Calculation of the number of sample plots for measurements within A/R CDM project activities

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| No internal applicability conditions |

AR-Tool 08: Estimation of non-CO2 greenhouse gas (GHG) emissions resulting from burning of biomass attributable to an A/R CDM project activity

| Condition | Justification |
|---|---|
| The tool is applicable to all occurrences of fire within the project boundary.<br><br>Non-CO2 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. | Any instance of fire larger than the minimum threshold of 1 ha as reported by the host party will be reported and accounted for provided that the accumulated area affected by such fires in a given year is ≥5% of the project area. |

AR-TOOL 12: Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities

| |
|---|
| No internal applicability conditions |

AR-TOOL 14: Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities

| |
|---|
| No internal applicability conditions |

AR-Tool 15: Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity

| Condition | Justification |
|---|---|
| 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. | There is no project leakage due to displacement of pre-project agricultural activities. Therefore, the project will not cause, directly or indirectly, any drainage of wetlands or peatlands. |

AR-Tool 16: Estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities

| Condition | Justification |
|---|---|
| The areas of land to which this tool is applied:<br>(i) Do not fall in the wetland category;<br>(ii) Do not contain organic soils as defined in the "Annex A: glossary" of the IPCC GPG LULUCF 2003;<br>(iii) Are not subject to any of the land management practices and application of inputs as listed in the Tables 1 and 2 of AR-Tool 16; | Demonstrated above (AR-ACM0003). |
| The A/R CDM project activity meets the following conditions:<br>(i) Litter remains on site and is not removed in the A/R CDM project activity;<br>(ii) Soil disturbance attributable to the A/R project activity, if any, is:<br>-In accordance with appropriate soil conservation practices, e.g. follows the land contours<br>-Limited to soil disturbance for site preparation before planting and such | Over the project duration, litter will remain on site and will not be removed. Soil disturbance during project implementation will be minimal. The highest soil disturbance rate for the project measures is 10%, caused by one-time subsoiling in preparation for mechanical planting (rows of 0.4m width every 4m). |

| | |
|---|---|
| disturbance is not repeated in less than twenty years. | |

AR-TOOL 17: Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities

| |
|---|
| No internal applicability conditions |

### 3.1.3 Project Boundary

*Table 9: Project Boundary*

| Source | | Gas | Included? | Justification/Explanation |
|---|---|---|---|---|
| Baseline | Above Ground Biomass | $CO_2$ | Yes | The project implementation area shows isolated trees and shrubs in the baseline. The carbon stock in the baseline is considered zero as explained in chapter 3.2.1 “Baseline Emissions”. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Below Ground Biomass | $CO_2$ | Yes | For justification see AGB above. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Dead wood and litter | $CO_2$ | Yes | A reduction of the dead wood and litter carbon pools due to project activity is not to be expected. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Soil organic carbon | $CO_2$ | Yes | A reduction of the soil organic carbon pool due to project activity is not to be expected. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |

| | | | | |
|---|---|---|---|---|
| | | Other | No | n.a. |
| Project | Above Ground Biomass | $CO_2$ | Yes | AGB is the main carbon pool of the project and accounted for as indicated by AR-Tool 14. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Below Ground Biomass | $CO_2$ | Yes | BGB is expected to increase with AGB. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Dead wood and litter | $CO_2$ | Yes | Carbon stock in Dead wood and litter is expected to increase due to project implementation, as indicated by AR-Tool 12. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |
| | Soil organic carbon | $CO_2$ | Yes | Carbon stock in Dead wood and litter is expected to increase due to project implementation, as indicated by AR-Tool 16. |
| | | $CH_4$ | No | n.a. |
| | | $N_2O$ | No | n.a. |
| | | Other | No | n.a. |

### 3.1.4 Baseline Scenario & Demonstration of additionality

As large-scale projects need to apply AR-Tool 02: “Combined tool to identify the baseline scenario and demonstrate additionality in A/R CDM project activities”, the Baseline Scenario analysis and proof of additionality are combined in this chapter.

The baseline scenario is identified and additionality demonstrated by following the steps indicated in AR-Tool 02.

**Step 0: Preliminary screening based on the starting date of the A/R project activity**

The land that is leased for the development of the proposed project activity is eligible according to the criteria and conditions set under the AR-ACM0003 'Large-scale Consolidated Methodology for Afforestation and reforestation of lands except wetlands version 02.0' for this project. The Green Branch initiates project activities after 31 December 1991 and before the date of registration at VERRA.

Implementing an biodiversity oriented ARR project in the region would face imperative finance, institutional and socioeconomic barriers. In the absence of carbon finance, the project does not have a secured stream of direct revenues, there is no institutional structure to receive benefits from ecological improvements and it is not common in the region. Such barriers would prevent implementation of such a project if it didn't receive VCU and CCB certification.

Thus, the incentive arising from the sale of the planned CERs was catalytic for making the decision to proceed with the proposed project activity. Carbon sequestration and sales from carbon offsets are essential for project realization. Generating and trading carbon credits secures financing over the project's lifetime and allows it to overcome the obvious investment barrier of ecologically focused ARR activities.

**STEP 1 - Identification of alternative land use scenarios**

Taking into consideration available information from stakeholders and literature, and by examining the historical land use in the past for the broader project region, three potential alternative scenarios were identified:

1. Cattle pasture

The Brazilian Pampa region shows a stable number of cattle from 1990 to 2013 (Silveira et al., 2017). As a land use, pasture is not restricted by many factors since cattle can graze in most of the areas of the region. The abundance of grass provides a stable provision of fodder for the animals making livestock rearing an ideal agricultural choice for a landowner (Pereira et al., 2018). Cattle can move around freely and graze even on steeper slopes which are usually not suitable for other typical uses (e.g. cultivation with mechanical means). The lands will continue to be used for extensive overgrazing, continuing the cycle of soil degradation and compaction, pasture nutrient loss through grazing and erosion, water loss and quality deterioration through runoff and reduced ability of the landscape to retain rainfall in the aquifer (Viana et al., 2021).

Woody vegetation is suppressed systematically in order to keep the areas open and increase pasture productivity. Common practices include cut clearing and burning of trees and shrubs (Singh & Huang 2022). Land management regime does not allow for natural regeneration to occur. Forest fragmentation reduces connectivity between forest species populations and limits the potential of biodiversity recovery.

2. Soy/Cereal crops

Agriculture emerged as one of the predominant land uses in the rural areas of Rio Grande do Sul. Natural grassland types that occupy large areas in the state offered a unique opportunity for the expansion of the agricultural frontier and led to large scale conversions of natural vegetation (including forests) (Silveira et al., 2017; Hermann et al., 2016). Agricultural intensification started about three decades ago and transformed large parts of the region. *'In the 1990s, an agriculturisation process (Barsky & Gelman 2001) began and improved throughout the 2000 to 2010 period, favored by direct sowing technologies and global market demand for grains and fibers. Rice crops in valleys and wetlands, soja crops, artificial prairies and silviculture occupy a growing area in the region (Pillar et al., 2009), suppressing large parts of the natural cover of the Campos area and its extensive grazing activities'* (Gautreau & Velez 2011).

In recent years, the great profitability that commodity prices have generated for farmers has encouraged an expansion of grain planting in Rio Grande do Sul (Beledeli 2021). With prices for one 60 kg-sack of soy rising from R$28 in 2005 to R$158 in 2021, this crop in particular is very prominent in the region (Agrolink 2022). *"Rio Grande do Sul is the second largest soybean producer in Brazil. In the 2020/2021 harvest, the gauchos grew soybeans on 6 million hectares, reaching a production of 20 million tons of grains*" (Embrapa 2021). Due to high revenue and demand from international markets, planting soy is many times the first choice made by landowners in areas where cultivation is suitable. However, not all areas are best suited for cultivating soy. The ideal plots need to have fertile soil to enable plant growth and they need to be not very steep in order to allow for mechanized cultivation (e.g. mowing, plowing, application of fertilizers and pesticides, harvesting etc).

At the same time, producing soy is extremely harmful for the environment as it involves intense management and requires a lot of agro-chemical inputs. Chemical fertilizers and pesticides are needed to ensure yields of high quantity and quality (Concenço 2017). The latter, in combination with the absence of natural vegetation (that can act as a buffer and a filter for this pollution), results in pollution spillover. Nutrients and chemicals are washed down (or carried away by the wind for sprayed chemicals) and enter the waterways through runoff water causing pollution of aquifers and soil, eutrophication and other negative impacts on ecosystem health and biodiversity.

3. Eucalyptus and other silviculture

Silviculture is an activity that was introduced relatively recently in the region and developed a new rural business community. According to related research, *'the implementation of eucalyptus monoculture policies especially in the south of Rio Grande do Sul State (SRS), was constituted through an economic policy strategy. This strategy was mostly articulated by private and public agents during the 2000s, who had the same economics-developmentalist ideological perspective in understanding employment creation and regional development'* (Da Rocha et al. 2020). In the 2000s, the area of forestry increased by 30% in Rio Grande do Sul State in only 10 years by a handful of forestry companies.

However, the unprecedented expansion of silviculture in the region did not come uncontested. Alarmed by the adverse impacts of eucalyptus monocultures on the environment and native biodiversity, environmental NGOs and some of the scientific community led intense campaigns, denouncing the environmental and social effects of this activity. Concern was raised on the basis of academic investigation which documented the negative ecological effects on soils, water and biodiversity of tree plantations and

associated the wood pulp industry, as well as social impacts related to displacement (Gautreau & Velez 2011). Indeed, the negative ecological and environmental impacts of eucalyptus monocultures have been the subject of several studies (Bayle 2019, Liu & Li 2010).

The most usual arrangement is that the landowner merely leases his land to a forestry company and in return, receives rent. The company guarantees purchase of the produced timber and provides all necessary materials, technology, technical support, documentation and certification for the plantation. On average, a cycle of eucalyptus cultivation is 6-8 years. The contracts for leasing land are usually for 2 cycles (14 years on average). The areas prioritized for cultivating commercial plantations are areas that are steeper and (may) have low soil fertility. That is because smoother and more fertile areas are used to cultivate soy and other cereals, due to higher and quicker return in profits, compared to silviculture.

A eucalyptus land use scenario will perpetuate the related adverse environmental effects and intensify social conflicts between different actors in society. Successive cycles of eucalyptus monoculture on the same land parcel result in significant degradation of soils. In addition, eucalyptus plantations have negative impacts on water resources due to high water demand that the typical commercial species have. Moreover, eucalyptus plantations require considerable amounts of chemical inputs, such as pesticides for controlling ants.

The landowner can ask the company to kill the stumps with glyphosate once the contract is terminated. After that, the land remains with the dead stumps until they decompose. In cases where there is no application of glyphosate, landowners have to tend the coppice of eucalyptus which is a rather intensive and costly management process. In both cases, organic waste and debris is left on the plots which are expensive to remove for using the land for something else. Therefore, transition to a different land use, such as the cultivation of crops, becomes rather complicated. As a result, the most likely outcome of the latter would be that such parcels are used for cattle ranching, since it is the only alternative option that does not require a significant investment to prepare the land, as cattle can freely graze around the dead eucalyptus stumps.

**STEP 2 - Barrier analysis**

1. Cattle pasture

Ranching cattle is a tradition in the RS state as local gauchos have been rearing livestock on the nutrient rich grasses of the Pampas since colonial times. It is widely accepted by local society and pastures are considered a traditional land use type. Locals feel very proud for their gaucho lifestyle which is often commemorated with rodeos and similar festivities.

Furthermore, there are no serious geographical or land suitability barriers for this land use scenario. Cattle ranching can occur in the majority of the land in the state, as it is not affected by slope or soil fertility. Cattle can graze on steeper lands with ease and pasture lands do not require any operations involving machinery. Additionally, even areas that are not available for other land uses (such as silviculture or crop cultivation), known as the permanent protection areas (APP), can still be used for grazing. There is no requirement to fence off APP and it is usual for cattle to roam throughout the whole extent of a landowners' property.

Moreover, this land use scenario is not facing any impeding legislation since there is not a regulatory framework with strict rules that can seriously affect a landowners' plan to raise cattle on his lands (apart from not clearing the APP which as mentioned earlier, can still be used for grazing). For example, an environmental permit or zoning plan does not exist for pastures, such as in the case of silviculture (elaborated below).

Finally, beef production offers a secure revenue flow for landowners and requires low investment costs. In RS, the costs of cattle rearing on pastures were estimated at 113 $/ha/year, while the revenues are 214.5 $/ha/year (Pereira et al., 2018). At the same time, historical price data for beef show that the value of the commodity has steadily been increasing. In fact, on average the price per kilo of beef has doubled from 2019 to 2021 (Agrolink 2022). As a result, landowners have little hesitation for using their lands as pastures since there is confidence around the stability of the market for beef.

By conducting an analysis of the general situation in the region through literature, existing data, legislation and anecdotal information, it has not been possible to identify barriers that can prevent cattle pasture as a baseline scenario.

2. Soy/Cereal crops

The productivity of soy crops in the state of Rio Grande do Sul doubled throughout the past 40 years due to improvements of cropping patterns, fertilization systems and genotypes with greater resistance to pests and diseases (from 1000-1600 kg/ha in the1970s to 2300-3000 kg/ha in the 2010s) (Concenço et al., 2017).

However, the high demand of inputs such as seeds and agrochemicals in addition to investments in machinery for soy cultivation, leave landowners with a high economic risk and often put them in dependency of financial institutions (Bicudo Da Silva et al., 2020). Moreover, the revenue from the crop yield is threatened through droughts, such as just experienced in the current season of 2021/2022. Due to a very dry and hot spring in 2021, farmers in Rio Grande do Sul could not plant all the fields intended for soy or had to replant them (Siqueira 2022). At the beginning of 2022 yield losses of up to 90% were predicted for Soy crops in Rio Grande do Sul unless the outlook for scarce rain would change soon (Vara & Mano 2022). Such risks of high investments without a guaranteed return of income leads landowners to only plant soy on their most fertile lands that are easily accessible with machinery. Areas showing high suitability for soy cropping, in turn, are not in discussion for The Green Branch´s projects as these will primarily be implemented on previously deforested pasture land. Livestock grazing represents one of the greatest region's land use types, as it functions as a secure revenue source for landowners, being independent of soil quality and slope steepness and does not require the removal of Eucalyptus stumps. Therefore, the scenario of soy crop cultivation in the relevant areas is not expected and cannot be substantiated by the existing evidence.

3. Eucalyptus and other silviculture

Eucalyptus, as a fast-growing species, has been extensively used in commercial cultivation to meet the demand for various uses including pulp and paper, biofuels and timber. At the same time, expansion of eucalyptus monocultures has strongly been contested for various reasons. Among the most serious reasons is the high water demand of eucalyptus which significantly impacts the local water resources in the areas that it is used. As Albaugh et al. (2013) suggest, '*the water use of Eucalyptus is a controversial issue, and the impacts of these fast-growing trees on water resources are well documented*'. Moreover, eucalyptus monocultures have been often referred to as 'green deserts' (Böhm & Brei 2008) due to the negative impacts that they have on biodiversity, especially in areas where afforestation using the species has been proposed as a potential approach to combine economic activity with ecological improvement. The impacts of monoculture expansion on biodiversity in the Pampas region has been the focus of several studies (Böhm & Brei 2008, Da Rocha et al., 2020, Gautreau & Velez 2011). Moreover, eucalyptus plantations require a lot of agrochemical inputs such as pesticide use, to make up for the limited resilience of single species forest stands to respond to pests and diseases. In fact, the pulp and paper industry is regarded as '*one of the most polluting industries in the world*' (Böhm & Brei 2008).

Due to the ecological and environmental impacts of monoculture plantations, silviculture has been targeted for legislative regulation through the implementation of related laws and policies.

According to Brazil's environmental legislation, each plantation of exotic trees requires a public environmental permit. Art. 225 of the Constitution of the Republic asks for an environmental impact assessment for all activities that could potentially lead to degradation of the environment. In RS, silviculture activities with non-native species require EIA/RIMA for plantations larger than 1000ha (except in cases of invasion risk. Single Licence for up to 40 ha) (Farenzena Zanchet Advocacia Ambiental 2019, Junior et al., 2018).

In our region, Rio Grande do Sul (RS), the Environmental Zoning for Silvicultural Activity, or Zonamento Ambiental da Silvicultura (ZAS), was designed by the State Environmental Administration to regulate the implantation of Eucalyptus, Pine, and Acacia tree-farms on its territory. After going through a couple of revision rounds, ZAS was implemented in its current form in 2010. The zoning plan was developed as a tool to guide the licensing process. *'In the final version, the rules referred to a mixed spatial unit (watersheds divided by landscape unit) and concerned the maximum percentage of this spatial unit allowed to be planted with tree farms, the maximum tree plantation size and the minimum distance between tree plantations. The maximum percentages, maximum sizes and minimum distances were specific to each spatial context and based on a ranking of criteria that included the water availability of each watershed and the vulnerability of each landscape unit.'* (Gautreau & Velez 2011). The legislation can be seen as a real hurdle that hinders further expansion of silviculture in the region. That's because it sets a spatially defined (per watershed) cap in the hectares of plantations that can be allowed. The limit for licensing eucalyptus plantations has been reached in many municipalities of RS. In absolute terms, ZAS reduced the size of the potential area to be planted with trees from 8 to 3.5 million hectares.

The strict legislative context in which forestry operations need to be undertaken, has discouraged many companies from realizing their operations for establishing a strong presence in the Pampas region. The example of Stora Enzo is quite indicative of the latter. Stora Enzo is a Swedish-Finnish pulp and paper

company that intended to settle in the Campanha region south-west of RS (including Bagé). The company, however, abandoned the project after several obstacles were encountered in the State, the restrictions imposed on the planting of Eucalyptus by the ZAS, the consequent difficulty in environmental licenses for silviculture activities and the impediment to the purchase of land by foreigners in the border belt of the land (Serviço Florestal Brasileiro, no date).

Despite the fact that silvicultural areas are increasing comparatively per year, the situation certainly did not meet the expectations of the silviculture industry who initially aspired to create a lot more plantations. In addition, from anecdotal information provided by an experienced broker in the sector, we know that the yearly increase of planted hectares in absolute numbers is not explained by more landowners deciding to plant eucalyptus, but is actually due to companies buying land (usually through an intermediary) to expand their activities. Finally, in recent years, according to official reports coming from the Associação Gaúcha de Empresas Florestais (AGEFLOR), '*the increase in the coverage of commercial plantations, should not be linked to the effective area increase planted in the period, but to the constant environmental regularization of the projects before Fepam and to a better methodology of data acquisition due to the availability of high spatial resolution images of RS*' (AGEFLOR, 2020).

The barriers that a eucalyptus baseline scenario would face, are not only institutional. In recent years, the social barriers for silviculture have been strengthened significantly. Despite the initial promise for prospering by entering the silviculture industry, landowners instead experienced the extremes of euphoria and frustration in less than 10 years. In the beginning, three projects promised to invest R$ 12.9 billion (at today's prices) in the state, between forests and industries. Votorantim Celulose Papel (VCP) and Stora Enzo backed out. Only R$5 billion were invested by the Chilean CMPC, representing less than half of what was announced by the three paper giants (Mariano, 2013). This has weakened the initial excitement in the region as well as the interest of private landowners to get in eucalyptus cultivation. On top of that, some landowners that did plant eucalyptus on their lands, reportedly have faced issues in their arrangement with a company as sometimes harvest was not done on time. A lack of trust from landowners established towards the forestry industry.

Landowners are not the only social group that has lost confidence towards the idea of silvicultural intensification. In fact, some groups around the Campos region were against the idea in the first place. *'Among activities led by agribusiness companies, silviculture was the main target of social movement critics, mainly because it received massive public subsidies and export facilities after planting trees and manufacturing paper pulp factories (Alvarado 2008).'* Silviculture plantations also caused conflicts with the social and scientific conservation communities. As reported in Gautreau and Velez (2011) *'in the state of RS, intense campaigns led by environmental NGOs and some of the scientific community denounced the environmental and social effects of this activity, in the basis of academic investigation which point out the negative ecological effects on soils, water and biodiversity of tree plantations and associated the wood pulp industry.'*

Commercial tree plantations have also caused tension and conflict about land ownership. Overbeek (2012) describes how 'In Rio Grande do Sul, in 2008, the MST (landless rural workers movement) won another important land battle against Aracruz/Fibria, after years of protests, lawsuits and pressure. They

succeeded in settling almost 250 landless families on a cattle farm of 5,000 hectares, a property which had been designated for Aracruz/Fibria eucalyptus plantations.'

In the period from 2016 to 2019 there was an increase in the conversion of forestry areas to other uses, mainly for pasture and grain cultivation (AGEFLOR, 2020). Private landowners are not keen in continuing eucalyptus cultivation and renewing their contracts with one of the big forestry enterprises due to lack of trust and loss of enthusiasm. Local enterprises are facing serious restrictions due to strict regulation of silvicultural activity from the environmental administration in RS, namely the ZAS and environmental permits. The law that forbids foreigners to acquire land in Brazil, eliminates the possibility of the industry being revitalized from the entry of big companies from abroad.

All the above complications, come on top of the already existing conflicts that silviculture has caused in the region which involves among others NGOs, social groups, academia and critics. Considering the overall situation that can be observed in the region currently, it is less likely that in the absence of the project, areas would be replanted with eucalyptus, despite having a recent history of commercial cultivation. By evidencing these barriers, eucalyptus plantations have been excluded from the baseline scenarios.

**Elimination of land use scenarios prevented by the identified barriers**

1. Soy

Soy crops face investment barriers (High input & machinery costs) and ecological condition barriers (Suitability of land; Risk of drought), which block this alternative scenario from forming the baseline.

2. Eucalyptus

Institutional barriers (Environmental license; Environmental Zoning for Silvicultural Activity) as well as social barriers (Lack of trust from landowners in Forestry Industry; Social conflicts) prevent Eucalyptus to form the baseline scenario for the CDM project activity.

**Not eliminated land use scenarios**

1. Cattle pasture

For cattle ranching, no preventive barriers were identified in the barrier analysis. Pasture land use does not require legal licensing, has low requirements in terms of geographical and ecological conditions of land and does not ask for high investments. Since Cattle pasture is the only land use scenario left after the barrier analysis, it forms the baseline and the analysis will conclude with the *'Demonstration of non-repetition of forestation'* and the *'Common practice analysis'* below.

**Demonstration of non-repetition of forestation**

Part of the land within the project boundary has been planted with fast-growing Eucalyptus species. In the years 2007-2010 the landowners started an agreement with companies of the pulp and paper industry to rent areas to them for 2 growing cycles of Eucalyptus (14 years). The land tenants took care of all silvicultural activities, including planting, management, harvesting and timber transport. Eucalyptus cycles have a duration of around 7 years, but the plantations were not harvested for more than 10 years due to unfavourable market conditions and legal hurdles for the industry. These unfulfilled expectations of the

landowners led to high mistrust towards the silviculture industry. In addition to that, high profitability of other land uses such as soy cultivation manifested the landowners' wish to exit Eucalyptus. A detailed description of barriers to Eucalyptus cultivation in the region can be found in the barrier analysis above. To conclude with, lands within the boundary of project activity that had been forested since 31 December 1989 will not be forested again without being registered as A/R CDM project activity. The landowner will not proceed with eucalyptus or any other commercial tree cultivation on his land due to unpleasant previous experience in the sector which led to his mistrust towards the industry. Such areas will be turned back to cattle pastures as this is the land use scenario that is not prevented by any barriers, as described in the previous section.

**STEP 4. Common practice analysis**

Forestation activities in the region are quite common in the form of afforestation for commercial purposes. Forest plantations substantially expanded and became established in the 1960s because of subsidies and tax incentives (AGEFLOR, 2020). Favourable conditions aimed to stimulate the market in order to satisfy demand for pulp, paper, construction wood, charcoal and fuelwood, biofuels, medicine, furniture and other uses. Trees from planted forests are responsible for about 91% of the total wood produced for use in industry in Brazil (IBÁ, 2019).

Planting in commercial plantations involves planting single species, usually fast growing, to ensure maximum biomass growth (stock of wood). This way of cultivation is known as a monoculture. In our project region, the most common species used are Eucalyptus spp. (predominant), Acacia spp. and Pinus spp. The coverage of planted forests in RS is 1.03 million hectares. The planted forests in RS represent 11% of the national total (AGEFLOR, 2020).

Commercial cultivation requires inputs of fertilizers, herbicides and pesticides which seriously impacts the environment. It also has negative impacts on soils and water resources. As a response to the rampant expansion, the environmental administration of RS drafted the ZAS which came into force in its current version in 2010.

Despite the existence of forestation activities in the project area, these are immensely different to the proposed A/R CDM activity. First, commercial silviculture has the direct economic incentive of wood sales for planting the forest which gives it a clear market-oriented purpose. In turn, this enables the attraction of investment capital and the creation of a business case. These characteristics have made it possible to establish subsidies and tax incentives for the forestry sector. Furthermore, afforestation activities of this type use non-native species since fast growth rates and suitability for industrial uses are of essential importance. Thus, it is not necessary for silvicultural activities to be compatible with conservation objectives as they usually do not involve native species and are not aimed at restoring native forest formation types.

On the contrary, the main objective of the proposed A/R CDM activity is to restore native forest formations in the south RS Pampa biome. Doing this involves planting a variety of tree species that are native to the region. There is minimal disturbance and soil tillage during implementation as well as minimal pressure on local water resources. The prime aims of the project are climate, community and biodiversity related, and not to satisfy the demand for particular resources. Which means, there is a fundamental difference between the proposed activity and other similar afforestation activities with regards to market conditions. There is no commodity or resource produced that can be traded in a similar commercial setting,

nor can it attract the same levels of investment and subsidization. In essence, the A/R CDM activity is obviously distinct to other similar afforestation activities in the region when it comes to objectives, approach, species used, target market and market conditions.

Restoration of threatened forest elements in the Pampas biome by planting a biodiverse mix of native tree species aimed to serve the carbon market is the first of its kind in the region. Reforestation and afforestation with a pure ecological focus is not common in the project area. The grouped project is a pioneer initiative and its unique elements of ecological design and objectives clearly demonstrate additionality.

### 3.1.5 Methodology Deviations

There are no deviations from the applied methodology AR-ACM0003 and related tools (as described in 3.1.1) for this grouped project.

## 3.2 Quantification of GHG Emission Reductions and Removals

### 3.2.1 Baseline Emissions

According to the applied methodology AR-ACM0003, baseline net GHG removals shall be calculated as follows:

$$\Delta C_{BSL,t} = \Delta C_{TREE\_BSL,t} + \Delta C_{SHRUB\_BSL,t} + \Delta C_{DW\_BSL,t} + \Delta C_{LI\_BSL,t} \quad \text{Equation (1)}$$

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 |

AR-Tool 14 allows for baseline carbon stock and change in carbon stock in trees (CTREE,BSL) and shrubs (CSHRUB,BSL) to be estimated as zero if all of the following conditions are met:

(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.

Vegetation in the project region consists mainly of grasslands with scattered trees and shrubs, while forested areas are largely confined to the riverine areas. The ARR project activities take place in deforested areas and converted grasslands for other land use purposes. The project fulfils all the criteria mentioned above. No harvesting/clearance of pre-project woody biomass is taking place throughout the project duration, which is also documented in the contracts with the landowners. There will be no risk of competition between pre-project trees and trees planted in the project area. Planting native tree species results in a trajectory of natural succession similar to that found in the region, ensuring a natural transition between planted and pre-project forest. Furthermore, the permanent sample plots for biomass monitoring are all located in areas containing no woody biomass at the project start to guarantee the exclusion of pre-project trees in carbon stock monitoring. Through regular analysis of remote sensing data, the continued existence of the pre-project forest patches will be monitored until the end of the crediting period.

In addition to the criteria listed above, changes in carbon stocks in trees and shrubs in the baseline may be accounted as zero for those lands for which the project participants can demonstrate that the following applies:

(a) Presence of gully, sheet or rill erosion; or landslides, or other forms of mass-movement erosion;

The absence of woody vegetation in the majority of the landscape adversely affects soil erosion, fertility, and water retention (Kucera et al., 2020). The photos below show the extent of erosion on the project site.

*Figure 7: Erosion on project site*

(c) Land comprises of bare sand dunes, or other bare lands;

The following photos are taken to demonstrate soil degradation due to overgrazing of the fields of the project area. High animal stocking rates on pasture land led to extensive overgrazing in the southern Rio Grande do Sul region, resulting in soil erosion and loss of soil carbon (Modernel et al., 2016). The consequences are exposed topsoil, trampled vegetation and close to no plant cover.

*Figure 8: Bare land on project site*

(d) 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;

Woody vegetation is suppressed systematically in order to keep the areas open and increase pasture productivity. Slash-and-burn are common practices to clear land from trees and shrubs (Singh & Huang 2022), as demonstrated on the drone photos below, taken by the project proponent in the region of southern Rio Grande do Sul.

*Figure 9: Slash-and-burn near project site*

By proving compliance with the criteria of AR-Tool 14, baseline emissions for the grouped project will be accounted as zero.

### 3.2.2 Project Emissions

This chapter explains the calculation of the ex-post project emissions, reflected by the change of carbon stocks per year.

Actual net GHG removals by sinks

In accordance with methodology AR-ACM0003, GHG emissions resulting from removal of herbaceous vegetation, combustion of fossil fuel, fertiliser application, use of wood, decomposition of litter and fine roots of N-fixing trees, construction of access roads within the project boundary, and transportation attributable to the project activity shall be considered insignificant and therefore accounted as zero.

Actual net GHG removals by sinks in year (t) are calculated as follows:

$$\Delta C_{ACTUAL,t} = \Delta C_{P,t} - GHG_{E,t} \quad \text{Equation (2)}$$

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 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 |

The parameters used in the equation will be discussed below.

Increase in non-CO2 GHG emissions within the project boundary

The latter parameter of the equation is determined through AR-Tool 08: "Estimation of non-CO2 greenhouse gas (GHG) emissions resulting from burning of biomass attributable to an A/R CDM project activity". Project activities do not include biomass burning for site preparation. On the contrary, project activities will result in the cessation of combustion activities that are common in the baseline scenario. Therefore, this parameter can be safely and conservatively estimated to be zero. Natural or accidental occurrences of fire within the project boundary will be monitored and reported as described in the Adaptive Management Plan.

Change in the carbon stocks in project in year (t)

Change in carbon stocks in the selected carbon pools will be considered through the following equation:

$$\Delta C_{P,t} = \Delta C_{TREE\_PROJ,t} + \Delta C_{SHRUB\_PROJ,t} + \Delta C_{DW\_PROJ,t} + \Delta C_{LI\_PROJ,t} + \Delta SOC_{AL,t} \quad \text{Equation (3)}$$

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 biomass 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 biomass 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*, as estimated in the tool "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities"; t $CO_2$-e |

The change in total carbon stocks is estimated as a sum of the change in individual carbon stocks, which are quantified through their respective tools. These carbon stocks and their rate of change will be discussed individually.

Change in carbon stock in tree biomass

Change in carbon stock in trees between two points of time (ΔCTREE_PROJ,t) and the associated uncertainty are estimated directly by re-measurement of permanent sample plots. Therefore, the following equations from AR-Tool 14 shall be applied:

$$\Delta C_{TREE} = \frac{44}{12} \times CF_{TREE} \times \Delta B_{TREE}$$ Equation (3)

$$\Delta B_{TREE} = A \times \Delta b_{TREE}$$ Equation (4)

$$\Delta b_{TREE} = \sum_{i=1}^{M} w_i \times \Delta b_{TREE,i}$$ Equation (5)

$$u_{\Delta C} = \frac{t_{VAL} \times \sqrt{\sum_{i=1}^{M} w_i^2 \times \frac{s_{\Delta,i}^2}{n_i}}}{|\Delta b_{TREE}|}$$ Equation (6)

Where:

$\Delta C_{TREE}$ = Change in carbon stock in trees between two successive measurements; t $CO_2e$

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

| | | |
|---|---|---|
| $\Delta B_{TREE}$ | = | Change in tree biomass within the biomass estimation strata; t d.m. |
| $A$ | = | Sum of areas of the biomass estimation strata; ha |
| $\Delta b_{TREE}$ | = | Mean change in tree biomass per hectare within the biomass estimation strata; t d.m. $ha^{-1}$ |
| $w_i$ | = | Ratio of the area of stratum *i* to the sum of areas of biomass estimation strata (i.e. $w_i = A_i/A$); dimensionless |
| $\Delta b_{TREE,i}$ | = | Mean change in carbon stock per hectare in tree biomass in stratum *i*; t d.m. $ha^{-1}$ |
| $u_{\Delta C}$ | = | Uncertainty in $\Delta C_{TREE}$ |
| $t_{VAL}$ | = | 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 |
| $s^2_{\Delta,i}$ | = | Variance of mean change in tree biomass per hectare in stratum *i*; $(t\ d.m.\ ha^{-1})^2$ |
| $n_i$ | = | Number of sample plots, in stratum *i*, in which tree biomass was re-measured |

Mean change in tree biomass per hectare in a stratum and the associated variance are estimated as follows:

$$\Delta b_{TREE,i} = \frac{\sum_{p=1}^{n_i} \Delta b_{TREE,p,i}}{n_i} \qquad \text{Equation (7)}$$

$$s^2_{\Delta,i} = \frac{n_i \times \sum_{p=1}^{n_i} \Delta b^2_{TREE,p,i} - \left(\sum_{p=1}^{n_i} \Delta b_{TREE,p,i}\right)^2}{n_i \times (n_i - 1)} \qquad \text{Equation (8)}$$

Where:

| | | |
|---|---|---|
| $\Delta b_{TREE,i}$ | = | Mean change in tree biomass per hectare in stratum *i*; t d.m. $ha^{-1}$ |
| $\Delta b_{TREE,p,i}$ | = | Change in tree biomass per hectare in plot *p* in stratum *i*; t d.m. $ha^{-1}$ |
| $s^2_{\Delta,i}$ | = | Variance of mean change in tree biomass per hectare in stratum *i*; $(t\ d.m.\ ha^{-1})^2$ |
| $n_i$ | = | Number of sample plots, in stratum *i*, in which tree biomass was re-measured |

If the uncertainty of the change in carbon stock in trees from Equation (6) is greater than 10%, an uncertainty discount according to the procedure provided in Appendix 2 of the tool will be applied.

Mean change in tree biomass per ha in a sample plot of stratum *i* (ΔbTREE,i) will be estimated through re-measurement of permanent sample plots in the project area. A detailed description of the biomass monitoring can be found in chapter 3.3.3 “Monitoring Plan”. To translate the tree measurements into above ground biomass, an allometric equation will be used, such as the following equation for moist tropical forest from Brown (1997):

AGBTREE = exp{-2,134+2,530*ln(DBH)}

AGBTREE represents the dry above ground biomass in [kg] per tree, DBH is the diameter at 1.30m, also referred to as diameter at breast height, measured in [cm]. The equation was developed based on destructive sampling of 170 trees in tropical moist forests and is suitable for native forests with an annual precipitation ranging from 1500-4000mm and a short to no dry season, thus fitting our project area. The coefficient of determination (R2) is 0.97 and therefore lies above the minimum of 0.85 as requested by AR-Tool 17. Therefore, the described Brown (1997) equation fulfils the criteria for ex-post allometric equations of AR-Tool 17: “Demonstrating appropriateness of allometric equations for estimation of aboveground tree biomass in A/R CDM project activities”. Brown (1997) equations were also used for measurements of other reforestation projects in the Atlantic Forest, such as by De Melo & Durigan (2006) and Tiepolo et al. (2002). Hence, we propose to use the equation presented by Brown (1997) unless we consider another equation more appropriate at the time of project verification.

The values applied for the carbon fraction and root shoot ratio including their justification are presented in Table 10 below. The root shoot ratio (RTREE) is a factor of the above ground tree biomass and represents the increase of below ground biomass due to project activity. Above ground biomass and below ground together reflect the total tree biomass. This tree biomass is summarised for all trees measured in plot p in stratum i and is then divided by APLOT,i (plot size of stratum i in [ha]), resulting in the tree biomass per ha in a sample plot of stratum i (ΔbTREE,p,i).

*Table 10: Applied parameters for carbon fraction and root shoot ratio*

| Parameter | Value | Project timeframe | Source | Justification |
|---|---|---|---|---|
| △CFTREE | 0,5 | 1-30yr | Ministry of Agriculture, Livestock and Food Supply - Brazilian Forest Service (2019) | Carbon fraction value recommended by the National Forest Service of Brazil. |
| RTREE | 0,25 | 1-30yr<br>If AGB < 125 t.d.m./ha | AR-Tool 14 | Conservative default value for the root shoot ratio of trees as suggested by CDM. |
| RTREE | 0,33 | 1-30yr | Table 4.4 of Chapter 4: Forest Lands of the report ‘Guidelines | Mokany et al. (2006) did an extensive review on root shoot ratios in different biomes and found |

| | | | | |
|---|---|---|---|---|
| | | If AGB > 125 t.d.m./ha | for National Greenhouse Gas Inventories (IPCC, 2006) | that in subtropical moist forests they are as high as 0.33 and in subtropical moist woodlands as high as 0.548. |

Change in carbon stock in dead wood and litter

This parameter is defined using AR-Tool 12: "Estimation of carbon stocks and change in carbon stocks in dead wood and litter in A/R CDM project activities". All applicability conditions are met, and the parameters are defined as follows:

| Parameter | SI Unit | Description |
|---|---|---|
| $C_{DW,t}$ | t $CO_2e$ | Carbon stock in dead wood within the project boundary at a given point of time in year *t* |
| $\Delta C_{DW,t}$ | t $CO_2e$ | Change in carbon stock in dead wood within the project boundary in year *t* |
| $C_{LI,t}$ | t $CO_2e$ | Carbon stock in litter within the project boundary at a given point of time in year *t* |
| $\Delta C_{LI,t}$ | t $CO_2e$ | Change in carbon stock in litter within the project boundary in year *t* |

For this grouped project, there will be no measurements of dead wood or litter. Instead, the conservative default-factor based method for estimation of carbon stock in dead wood and litter is used. The corresponding equations are as follows:

$$C_{DW,i,t} = C_{TREE,i,t} \times DF_{DW} \quad \text{Equation (9)}$$

Where:

$C_{DW,i,t}$ = Carbon stock in dead wood in stratum *i* at a given point of time in year *t*; t $CO_2e$

$C_{TREE,i,t}$ = Carbon stock in trees biomass in stratum *i* at a point of time in year *t*, as calculated in the tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t $CO_2e$

$DF_{DW}$ = Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass; per cent

$i$ = *1, 2, 3, …* biomass estimation strata within the project boundary

$t$ = *1, 2, 3, …* years elapsed since the start of the A/R CDM project activity

$$C_{LI,i,t} = C_{TREE,i,t} \times DF_{LI} \quad \text{Equation (15)}$$

Where:

$C_{LI,i,t}$ = Carbon stock in litter in stratum *i* at a given point of time in year *t*; t $CO_2e$

$C_{TREE,i,t}$ = Carbon stock in trees biomass in stratum *i* at a point of time in year *t*, as calculated in tool "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities"; t $CO_2e$

$DF_{LI}$ = Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass; percent

$i$ = *1, 2, 3, …* biomass estimation strata within the project boundary

$t$ = *1, 2, 3, …* years elapsed since the start of the A/R CDM project activity

The function is derived from the total carbon stock in trees. Therefore, DFDW and DFLI must be determined by the tool. The percentage is derived from the tables 5 and 6 in section 8 from the tool. The project region has a tropical moist climate (1654,8 mm rain per year in the municipality of Bagé) and is below 2000 metres in altitude. This leads to the following values:

DFDW = 6%

DFLI = 1%

Change in Soil Organic Carbon stock

This parameter is defined using AR-Tool 16: "Tool for estimation of change in soil organic carbon stocks due to the implementation of A/R CDM project activities". All applicability conditions are met, and the parameter is defined as follows:

| Parameter | Unit | Description |
|---|---|---|
| $\Delta SOC_{AL,t}$ | t $CO_2$-e | Change in SOC stock in areas of land meeting the above applicability conditions, in year *t* |

To be able to calculate the change of SOC, first the initial stock of SOC is calculated. This is being done with tables 3-6 of the tool and the following equation:

$$SOC_{INITIAL,i} = SOC_{REF,i} * f_{LU,i} * f_{MG,i} * f_{IN,i} \quad (1)$$

where:

| | |
|---|---|
| $SOC_{INITIAL,i}$ | SOC stock at the beginning of the A/R CDM project activity in stratum *i* of the areas of land; t C $ha^{-1}$ |
| $SOC_{REF,i}$ | Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation – normally forest) by climate region and soil type applicable to stratum *i* of the areas of land; t C $ha^{-1}$ |
| $f_{LU,i}$ | Relative stock change factor for baseline land-use in stratum *i* of the areas of land; dimensionless |
| $f_{MG,i}$ | Relative stock change factor for baseline management regime in stratum *i* of the areas of land; dimensionless |
| $f_{IN,i}$ | Relative stock change factor for baseline input regime (e.g. crop residue returns, manure) in stratum *i* of the areas of land; dimensionless |
| *i* | *1, 2, 3, …* strata of areas of land; dimensionless |

The reference SOC stock is determined by table 3 of the tool. Following the IPCC Climate Zones, the project is located in a Moist Tropical Area. According to the Harmonized World Soil Database published

by the FAO, the grouped project region covers the following soil types: Planosol, Phaeozem, Alisol, Leptosol, Vertisol (Fischer et al., 2008). These soils are classified as soils with high clay activity by ISRIC, the International Soil Reference and Information Centre, and form the major soil class of the Biome. Soils of low activity clay can only be found at the boundaries of the grouped project zone: Acrisols at the north-east border to the Atlantic Forest Biome, and Plinthosols and Nitisols at the north-west border. Lastly, a strip of sandy soils (Arenosols) is located along the coast of the Atlantic Ocean (Batjes 2009). (Batjes, 2009). As the HAC soils are the dominant soil class of the Biome, also representing the first project instance, according to AR-Tool 16 a reference SOC stock of 65 tC/ha in the topsoil can be assumed.

SOCREF = 65 tC/ha

Using Table 6 of the tool, fLU, fMG and fIN were determined. Grassland areas are assigned a land-use stock change factor of 1. The “Tool for the identification of degraded or degrading lands for consideration in implementing CDM A/R project activities” was applied to classify the project area as severely degraded land, resulting in a management stock change factor of 0,7 (see 3.2.1 of this document for documentation of soil erosion and overgrazing). Since no fertilizers are applied in basic management, factor 1 is to be applied.

fLU: 1,00

fMG: 0,70

fIN: 1,00

The above-mentioned values and factors result in an initial carbon stock of 45,5tC/ha. For each stratum subjected to soil disturbance of more than 10% of the stratum area due to project activities, a carbon loss factor of 0.1 has to be accounted for. Such soil disturbance is not taking place in the grouped project; hence this factor does not need to be applied.

$$SOC_{LOSS,i} = 0 \quad (3)$$

where:

| | |
|---|---|
| $SOC_{LOSS,i}$ | Loss of SOC caused by soil disturbance attributable the A/R CDM project activity, in stratum *i* of the areas of land; t C $ha^{-1}$ |
| 0.1 | The approximate proportion of SOC lost within the first five years from the year of site preparation |
| *i* | *1, 2, 3, …* strata of areas of land; dimensionless |

The following equation allows to determine the annual rate of SOC stock change [tC/ha/yr]:

$$dSOC_{t,i} = 0 \quad \text{for } t < t_{PREP,i} \tag{4}$$

$$dSOC_{t,i} = -\frac{SOC_{LOSS,i}}{1\ year} \quad \text{for } t = t_{PREP,i} \tag{5}$$

$$dSOC_{t,i} = \frac{SOC_{REF,i} - (SOC_{INITIAL,i} - SOC_{LOSS,i})}{20\ years} \quad \text{for } t_{PREP,i} < t \leq t_{PREP,i} + 20 \tag{6}$$

where:

| | |
|---|---|
| $dSOC_{t,i}$ | The rate of change in SOC stock in stratum *i* of the areas of land, in year *t*; t C $ha^{-1}$ $yr^{-1}$ |
| $t_{PREP,i}$ | The year in which first soil disturbance takes place in stratum *i* of the areas of land |
| $SOC_{LOSS,i}$ | Loss of SOC caused by soil disturbance attributable the A/R CDM project activity, in stratum *i* of the areas of land; t C $ha^{-1}$ |
| $SOC_{REF,i}$ | Reference SOC stock corresponding to the reference condition in native lands (i.e. non-degraded, unimproved lands under native vegetation – normally forest) by climate region and soil type applicable to stratum *i* of the areas of land; t C $ha^{-1}$ |
| $SOC_{INITIAL,i}$ | SOC stock at the beginning of the A/R CDM project activity in stratum *i* of the areas of land; t C $ha^{-1}$ |
| *i* | *1, 2, 3, …* strata of areas of land; dimensionless |
| *t* | *1, 2, 3, …* years elapsed since the start of the A/R CDM project activity |

This equation results in a potential increase in SOC of in total 19,5tC/ha over the first 20 years of the project, or respectively 0,975tC/ha/yr. Since the tool determines a maximum annual increase of 0,8tC/ha/yr, this value is applied for the first 20 years after project implementation.

dSOCt,i = 0,8 tC/ha/yr

This increase in SOC can be considered conservative compared to studies of soil samples from different land use classes in Rio Grande do Sul. Sanderman et al. (2017) compared SOC levels of pastureland with samples of Pampas grassland near Porto Alegre and Atlantic Forest near Santa Maria. The difference in SOC at 30 cm depth between the two land uses suggests a potential increase of 1,1 and 1,7 tC/ha/year, respectively, over a 20-year period.

### 3.2.3 Leakage

Potential leakage has to be determined through AR-Tool 15: "Estimation of the increase in GHG emissions attributable to displacement of pre-project agricultural activities in A/R CDM project activity". This tool provides procedures to determine the following parameter:

| Parameter | SI Unit | Description |
|---|---|---|
| $LK_{AGRIC,t}$ | t $CO_2e$ | Leakage emission due to the displacement of agricultural activities in year *t* |

The tool states that displacement of an agricultural activity by itself does not result in leakage emission. Leakage emission occurs when the displacement leads to an increase in GHG emissions relative to the GHG emissions attributable to the activity as it exists within the project boundary. Furthermore, the tool allows for leakage emission attributable to the displacement of grazing activities to be considered insignificant and hence accounted as zero if one of the following conditions applies:

(a) Animals are displaced to existing grazing land and the total number of animals in the receiving grazing land (displaced and existing) does not exceed the carrying capacity of the grazing land;

(b) Animals are displaced to existing non-grazing grassland and the total number of animals displaced does not exceed the carrying capacity of the receiving grassland;

(c) Animals are displaced to cropland that has been abandoned within the last five years;

(d) Animals are displaced to forested lands, and no clearance of trees, or decrease in crown cover of trees and shrubs, occurs due to the displaced animals;

(e) Animals are displaced to zero-grazing system.

Grazing livestock previously located on the project sites is displaced to existing grazing land where the total number of animals will not exceed the carrying capacity of the grazing land. Animals are also displaced to forested lands where no clearance of trees or decrease in crown cover of trees and shrubs occurs due to the displaced animals. The displacement of cattle will be traced through regular and close contact with the landowners and in case of unexpected leakage, it will be compensated for.

Hence, no net harm, positive emissions or decrease in carbon stock within or outside the project boundaries will occur. Therefore, leakage due to displacement of pre-project agricultural activities will be accounted for as zero throughout the project lifetime.

### 3.2.4 Net GHG Emission Reductions and Removals

This chapter explains and justifies the calculation of the ex-ante project emissions, reflected by the change of carbon stocks per year.

To estimate the change of carbon stocks for the selected pools, the equations presented in chapter 3.2.2 “Project Emissions” will be applied for below ground biomass, dead wood, litter, and SOC. The values applied for ex-post calculation will also be used for the ex-ante project carbon estimation.

Change in carbon stocks of tree and shrub biomass will be quantified using the following formula, adapted from formula 10 in AR-Tool 14. The values for Carbon fraction of tree biomass and the root shoot ratio can be found in Table 10: Applied parameters for carbon fraction and root shoot ratio.

$$\Delta C_{TREE} = \frac{44}{12} \times CF_{TREE} \times \Delta b_{FOREST} \times (1 + R_{TREE}) \times A$$

Where:

| | | |
|---|---|---|
| $\Delta C_{TREE}$ | = | Mean annual change in carbon stock in trees; t $CO_2e$ $yr^{-1}$ |
| $CF_{TREE}$ | = | Carbon fraction of tree biomass; t C $(t.d.m.)^{-1}$. |
| $\Delta b_{FOREST}$ | = | Mean annual increment of above-ground biomass in forest in the region or country where the A/R CDM project activity is located; t d.m. $ha^{-1}$ $yr^{-1}$. |
| $R_{TREE}$ | = | Root-shoot ratio for the trees in the baseline; dimensionless. |
| $A$ | = | Area; ha |

To quantify the mean annual increment of above ground biomass in forest in the region or country, tree growth and stand development were modelled based on literature research and field measurements. The research resulted in the estimation of a non-linear increase of biomass, reflecting the natural succession of a native forest, as presented and justified in Table 11 below. The average annual biomass increment throughout the project lifespan is 5,07 t.d.m./ha/yr and can be considered conservative compared to the average of 5,33 t.d.m./ha/year proposed by IPCC (2003), which is based on the climate-specific default values for years 1-30. Our non-linear model fits the regional climatic conditions and forest type better than the values proposed by the IPCC. Therefore, the latter are included in the table only as a comparative reference, but are not used for ex ante estimations of biomass growth.

*Table 11: AGB values*

| Parameter | Value | Project timeframe | Source | Justification |
|---|---|---|---|---|
| △bFOREST [t.d.m./ha/yr] | 4,41 | 1-9yr | Own field measurement of a reforestation project | Yearly average of a 9 year old reforestation project in the municipality of Bagé, located near the project site in the Serra de Sudeste and using the same or similar species as used in this project. Brown's (1997) allometric equation was used to translate measurements into biomass values. |
| △bFOREST [t.d.m./ha/yr] | 7,33 | 10-20yr | Poorter et al. (2016) | The average increment is based on the estimated biomass (120,3 t.d.m./ha) of a 20-year old neotropical secondary forest with an annual average precipitation of 1654,8mm, representing the mean rainfall in the municipality of Bagé (location of first project instance) from 1991-2020 (Da Silva 2010, WorldWeather 2022). |
| △bFOREST [t.d.m./ha/yr] | 3,19 | 21-30yr | Derived from trendline including old-growth native forest value of Rosenfield & Souza (2014) | The 30 year value (152,22 t.d.m./ha) was extracted from a trendline based on the available data points (9yr, 20yr, 66yr, 100yr values). The latter data point represents old-growth forest biomass data we derived from literature.<br><br>Watzlawick (2012) found old-growth subtropical mixed ombrophilous forest biomass of 250,9 t.d.m.<br><br>The most conservative old-growth value was applied in the model, measured by Rosenfield & Souza (2014) in a mixed Coniferous-Broadleaf Forest in Rio Grande do Sul, showing 250,3 t.d.m./ha. |
| △bFOREST | 7 | 1-20yr | IPCC Good Practice Guide for Land Use, | Default values for forests in subtropical climates with short dry seasons. These values are not |

| | | | | |
|---|---|---|---|---|
| [t.d.m./ha/yr] | 2 | 20-30yr | Land Use Change and Forestry, Table A3.1.5 (2003) | used in the estimation of biomass for this grouped project but serve as comparative reference. |

Table 12 below shows the estimated emission removals per carbon pool [tCO2e] per ha per year for the first 30 years after project implementation, applicable to all grouped project areas. It also includes the buffer of 10%, based on the non-permanence risk assessment report, and the thereafter resulting total annual ERs ha/year.

*Table 12: Estimated emission removals per carbon pool*

| Year | AGB | BGB | DW & LI | SOCO2 | All pools | Buffer | Annual ERs |
|---|---|---|---|---|---|---|---|
| 1 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 2 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 3 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 4 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 5 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 6 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 7 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 8 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 9 | 8,09 | 2,02 | 0,71 | 2,93 | 13,75 | 1,37 | 12,37 |
| 10 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 11 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 12 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 13 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 14 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 15 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 16 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 17 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 18 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 19 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 20 | 13,43 | 3,36 | 1,18 | 2,93 | 20,90 | 2,09 | 18,81 |
| 21 | 5,85 | 1,46 | 0,51 | 0,00 | 7,83 | 0,78 | 7,04 |
| 22 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 23 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 24 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 25 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 26 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 27 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 28 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 29 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| 30 | 5,85 | 1,93 | 0,54 | 0,00 | 8,33 | 0,83 | 7,50 |
| Total | 279,07 | 73,98 | 24,71 | 58,67 | 436,44 | 43,64 | 392,79 |
| Average | 9,30 | 2,47 | 0,82 | 1,96 | 14,55 | 1,45 | 13,09 |

Table 13 shows the accumulated emission removals (ERs) for the first 30 years of the first project instance, Fazenda Silêncio, with a planted area of 1119,8 ha, starting the crediting period on 09.10.2021.

*Table 13: Accumulated emission removals*

| Year | Estimated baseline emissions or removals (tCO2e) | Estimated project emissions or removals (tCO2e) | Estimated leakage emissions (tCO2e) | Estimated net GHG emission reductions or removals (tCO2e) |
|---|---|---|---|---|
| 2021 (Oct-Dec) | 0 | 3187,8405 | 0 | 3187,8405 |
| 2022 | 0 | 17039,7665 | 0 | 17039,7665 |
| 2023 | 0 | 30891,6925 | 0 | 30891,6925 |
| 2024 | 0 | 44743,6185 | 0 | 44743,6185 |

| | | | | |
|---|---|---|---|---|
| 2025 | 0 | 58595,5445 | 0 | 58595,5445 |
| 2026 | 0 | 72447,4705 | 0 | 72447,4705 |
| 2027 | 0 | 86299,3965 | 0 | 86299,3965 |
| 2028 | 0 | 100151,323 | 0 | 100151,323 |
| 2029 | 0 | 114003,249 | 0 | 114003,249 |
| 2030 | 0 | 127855,175 | 0 | 127855,175 |
| 2031 | 0 | 148918,613 | 0 | 148918,613 |
| 2032 | 0 | 169982,051 | 0 | 169982,051 |
| 2033 | 0 | 191045,489 | 0 | 191045,489 |
| 2034 | 0 | 212108,927 | 0 | 212108,927 |
| 2035 | 0 | 233172,365 | 0 | 233172,365 |
| 2036 | 0 | 254235,803 | 0 | 254235,803 |
| 2037 | 0 | 275299,241 | 0 | 275299,241 |
| 2038 | 0 | 296362,679 | 0 | 296362,679 |
| 2039 | 0 | 317426,117 | 0 | 317426,117 |
| 2040 | 0 | 338489,555 | 0 | 338489,555 |
| 2041 | 0 | 359552,993 | 0 | 359552,993 |
| 2042 | 0 | 367436,385 | 0 | 367436,385 |
| 2043 | 0 | 375834,885 | 0 | 375834,885 |

| | | | | |
|---|---|---|---|---|
| 2044 | 0 | 384233,385 | 0 | 384233,385 |
| 2045 | 0 | 392631,885 | 0 | 392631,885 |
| 2046 | 0 | 401030,385 | 0 | 401030,385 |
| 2047 | 0 | 409428,885 | 0 | 409428,885 |
| 2048 | 0 | 417827,385 | 0 | 417827,385 |
| 2049 | 0 | 426225,885 | 0 | 426225,885 |
| 2050 | 0 | 434624,385 | 0 | 434624,385 |
| 2051 (Jan-Sept) | 0 | 441090,08 | 0 | 441090,08 |

## 3.3 Monitoring

### 3.3.1 Data and Parameters Available at Validation

| | |
|---|---|
| Data / Parameter | CFTREE |
| Data unit | tC/t.d.m. |
| Description | Carbon fraction of tree biomass |
| Source of data | Ministry of Agriculture, Livestock and Food Supply - Brazilian Forest Service (2019) |
| Value applied | 0,5 |
| Justification of choice of data or description of measurement methods and procedures applied | Carbon fraction value recommended by the National Forest Service of Brazil. |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | dSOCt,i |
| Data unit | tC/ha/y |
| Description | Change in SOC stock in stratum i in year t |
| Source of data | Default value from AR-Tool 16 |
| Value applied | 0,8 (0-20yr)<br>0 (>20yr) |
| Justification of choice of data or description of measurement methods and procedures applied | Default value of the calculation model from AR-Tool 16: "Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities". |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | DFDW |
| Data unit | Dimensionless |
| Description | Conservative default factor expressing carbon stock in dead wood as a percentage of carbon stock in tree biomass |
| Source of data | Default value from AR-Tool 12 |
| Value applied | 0,06 |
| Justification of choice of data or description of measurement methods and procedures applied | The project region has a tropical moist climate (1654,8 mm rain per year in the municipality of Bagé) and is below 2000 metres in altitude. |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | DFLI |
| Data unit | Dimensionless |
| Description | Conservative default factor expressing carbon stock in litter as a percentage of carbon stock in tree biomass |
| Source of data | Default value from AR-Tool 12 |
| Value applied | 0,01 |
| Justification of choice of data or description of measurement methods and procedures applied | The project region has a tropical moist climate (1654,8 mm rain per year in the municipality of Bagé) and is below 2000 metres in altitude. |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | △bFOREST |
| Data unit | t.d.m./ha |
| Description | Ex-ante estimations of mean annual increment of above ground biomass |
| Source of data | Own field measurement of a reforestation project<br>Poorter et al. (2016)<br>Derived from trendline including old-growth native forest value of Rosenfield & Souza (2014) |
| Value applied | 4,41 (1-9yr)<br>7,33 (10-20yr)<br>3,19 (21-30yr) |
| Justification of choice of data or description of measurement methods and procedures applied | See Table 11: AGB values |

| | |
|---|---|
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | RTREE |
| Data unit | Dimensionless |
| Description | The root-shoot ratio used to determine the proportion of belowground biomass in relation to the aboveground biomass. |
| Source of data | AR-Tool 14<br>Table 4.4 of Chapter 4: Forest Lands of the report 'Guidelines for National Greenhouse Gas Inventories (IPCC, 2006) |
| Value applied | 0,25 (If AGB < 125 t.d.m./ha)<br>0,33 (If AGB > 125 t.d.m./ha) |
| Justification of choice of data or description of measurement methods and procedures applied | Conservative default value for the root shoot ratio of trees as suggested by CDM.<br>Mokany et al. (2006) did an extensive review on root shoot ratios in different biomes and found that in subtropical moist forests they are as high as 0.33 and in subtropical moist woodlands as high as 0.548. |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | CO2 fraction |
| Data unit | tCO2/C |
| Description | Equivalent of CO2 to the amount C |
| Source of data | AR-Tool 14, AR-Tool 16 |
| Value applied | 44/12 |

| | |
|---|---|
| Justification of choice of data or description of measurement methods and procedures applied | Default value of AR-Tool 14: "Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities" and AR-Tool 16: "Default value of the "Tool for estimation of changes in soil organic carbon stocks due to the implementation of A/R CDM project activities". |
| Purpose of data | Calculation of project emissions |
| Comments | NA |

### 3.3.2 Data and Parameters Monitored

| | |
|---|---|
| Data / Parameter | Ai |
| Data unit | ha |
| Description | Area of tree biomass estimation stratum i |
| Source of data | Satellite and/or drone imagery; Field measurement |
| Description of measurement methods and procedures to be applied | Areas where planting activities are implemented are measured based on satellite/drone imagery by the technical team of The Green Branch. In addition, the planting process is GPS tracked for ground truthing data of the planned ARR areas through local workers planting the trees. |
| Frequency of monitoring/recording | Initial measurement before and during planting, after that Ai will be monitored annually or at verification events. |
| Value applied | 1119,8ha (Fazenda Silêncio), |
| Monitoring equipment | Satellite imagery; Drone; GPS (Garmin); GPS on Smartphone; QGIS; |
| QA/QC procedures to be applied | The technical team is trained in monitoring and processing of satellite/drone imagery. Local workers are instructed on GPS tracking. |
| Purpose of data | Calculation of project emissions |
| Calculation method | NA |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | APLOT,i |
| Data unit | ha |
| Description | Area of a sample plot in stratum i |
| Source of data | Field measurement, AR-Tool 14 |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | Sample plots of each 10m x 10m (each at 0.01ha) are installed in stratum i. The definition of their location and instalment is described in chapter 3.3.3, “Methods for measuring, recording, storing, aggregating, collating and reporting data and parameters”. |
| Frequency of monitoring/recording | Before verification events, at least every 5 years. |
| Value applied | 0,01 |
| Monitoring equipment | GPS (Garmin); Rope; 4 poles at 4 edges of sample plot; Compass; Permanent steel or PVC mark installed at first monitoring event to determine exact location of sample plot; |
| QA/QC procedures to be applied | Training of the technical team in monitoring techniques to ensure accurate measurements. Training includes using GPS, layout of the sample plot and tree inventory techniques to ensure accurate biomass measurements. |
| Purpose of data | Calculation of project emissions |
| Calculation method | NA |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | ni |
| Data unit | Dimensionless |
| Description | Number of sample plots for tree biomass measurement in stratum i |
| Source of data | Calculated following AR-Tool 03 |
| Description of measurement methods and procedures to be applied | NA |
| Frequency of monitoring/recording | Before verification events, at least every 5 years. |
| Value applied | NA |

| | |
|---|---|
| Monitoring equipment | NA |
| QA/QC procedures to be applied | Following guidelines of AR-Tool 03 |
| Purpose of data | Calculation of project emissions |
| Calculation method | AR-Tool 03: "Calculation of the number of sample plots for measurements within A/R CDM project activities" |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | InstanceID |
| Data unit | Dimensionless |
| Description | Identification code for each project instance |
| Source of data | Project database |
| Description of measurement methods and procedures to be applied | The Project database will assign an ID code for each new instance register on the system. This ID will be used in all documents and tools related to that instance during the whole project implementation process . |
| Frequency of monitoring/recording | Once when adding a new project instance to the grouped project. |
| Value applied | NA |
| Monitoring equipment | NA |
| QA/QC procedures to be applied | Check project potential new instances against eligibility criteria before including it in this grouped project and ensure to assign it a code that allows clear distinction from other project instances. |
| Purpose of data | Calculation of project emissions |
| Calculation method | NA |

| | |
|---|---|
| Comments | NA |

| | |
|---|---|
| Data / Parameter | Nj,p,i |
| Data unit | Dimensionless |
| Description | Number of trees of species j in plot p of stratum i |
| Source of data | Field measurement |
| Description of measurement methods and procedures to be applied | Technical team counts the number of trees during monitoring events of biomass estimation sample plots. |
| Frequency of monitoring/recording | Before verification events, at least every 5 years. |
| Value applied | NA |
| Monitoring equipment | NA |
| QA/QC procedures to be applied | Training of our technical team to recognise tree species planted and naturally regenerated in the biomass estimation strata. |
| Purpose of data | Calculation of project emissions: Identification of tree species could be necessary for application of allometric equations to calculate tree biomass. |
| Calculation method | Counting |
| Comments | NA |

| | |
|---|---|
| Data / Parameter | DBH |
| Data unit | cm |
| Description | Diameter at breast height (1,30m) of tree of species j in sample plot p in stratum i |
| Source of data | Field measurement |

| | |
|---|---|
| Description of measurement methods and procedures to be applied | DBH of all trees of species j in plot p of stratum i is measured at 1,30 height (from base level of the tree) by the technical team. This is done during monitoring events of biomass estimation sample plots. A Caliper is used as a measurement tool. When measuring DBH, the jaws of the Caliper should point towards the permanently installed steel or PVC pole of the sample plot to ensure no deviations between 2 monitoring events due to irregular trunk shapes. |
| Frequency of monitoring/recording | Before verification events, at least every 5 years. |
| Value applied | NA |
| Monitoring equipment | Caliper |
| QA/QC procedures to be applied | Training of our technical team in accurate application of the Caliper and measurement methodology. |
| Purpose of data | Calculation of project emissions |
| Calculation method | NA |
| Comments | NA |

### 3.3.3 Monitoring Plan

**Methods for measuring, recording, storing, aggregating, collating and reporting data and parameters**

Of the selected carbon pools within the project boundaries, only above-ground biomass of trees and shrubs will be measured in the field. Carbon from belowground biomass, dead wood, litter, and soil organic carbon attributable to project activities will not be monitored but estimated through default values and methods suggested by AR-Tool 12, AR-Tool 14, and AR-Tool 16.

As described in chapter 3.2.2 “Project Emissions”, the methods for estimating biomass from field measurements follow allometric equations and calculations as set forth in Tool AR-AM0014: “Estimation of carbon stocks and change in carbon stocks of trees and shrubs in A/R CDM project activities”.

In this methodology, multiple ways of determining biomass are allowed. Carbon stock in trees at a point of time is estimated by using one of the following methods or a combination thereof:

A. Estimation by measurement of sample plots;
B. Estimation by modelling of tree growth and stand development;
C. Estimation by proportionate crown cover;
D. Updating the previous stock by independent measurement of change.

The monitoring plan of this grouped project will use option A) Estimation by measurement of sample plots, unless Verra introduces new methods which the project proponent assesses as providing higher accuracy and efficiency. Under the currently applied method, carbon stock in trees is estimated based on measurements of stratified random sample plots.

The technical team of TGB is in charge of measuring, recording, storing and reporting monitoring data from biomass estimation sample plots.

Step 1: Determining sample plots

The number of sample plots to measure biomass growth is determined based on the guidelines as set by AR Tool 03 “Calculation of the number of sample plots for measurements within A/R CDM project – Version 02.1.0”. The locations of the random sample plots are generated via an automated process in QGIS within the project implementation area, which is located in the grassland stratum. Each sample plot has a size of 0,01ha (10m x 10m). In case one of the sample plots would partly fall into another stratum (e.g., pre-project forest), the sample plot would be skipped and the next suggested one would be taken instead. This process is followed to avoid measuring pre-project biomass of the forest or shrubland-strata.

When the technical team arrives at the GPS located sample plot for the first time, they will put a permanent Steel or PVC mark in the ground at the sample plot centrum to ensure starting at the exact same location during following field measurements of the permanent sample plot. The area of the sample plot is determined by going 10m North from the permanent mark, then 10m East, then 10m South, and after that ending up at the permanent mark 10m to the West. To facilitate identification of trees that fall into the sample plot, borders should temporarily be marked with a rope, fixed by poles (e.g., screwdrivers) at all 4 edges of the sample plot.

Step 2: Measuring biomass in trees

To calculate biomass, the technical team must perform monitoring activities on several units. The technical team needs to measure the following data manually:

A. APLOT,i: The area of the sample plot in stratum i [ha];
B. Nj,p,i: The number of trees of species j in plot p in stratum i;
C. DBH: The breast-height diameter (at height 1.30m) of tree of species j in plot p in stratum i [cm];

The technical team together will work with the project coordinator to make an inventory on which species are found in the sample plot and in what quantity they appear. All trees that are rooted inside the sample plot are sampled. Of every tree, the diameter is measured with a Caliper which will be registered and assigned to each individual tree of a species j. Detailed descriptions of the measurement methodology

for each parameter can be found in the monitoring parameter tables above. The data from field sampling allows the technical team to calculate biomass stock present at monitoring time.

Step 3: Calculations of carbon stock

The completeness of data is checked by the Project Manager and technical team of TGB, after which the technical team applies appropriate calculations to determine the carbon stock in the plot area, biomass estimation stratum area and finally the total area. All calculations will be done according to the methodologies, as described in chapter 3.2.2 “Project Emissions”. These calculations will be repeated and checked in the internal audit by the Project Manager. Furthermore, there will be an internal or external check of the carbon stock calculations via remote sensing biomass monitoring.

Step 4: Data management

The recording, storing, aggregating and collating of the data happens via the TGB Dashboard and is carried out by the technical team. All data is stored here until 3 years after the end of the last crediting period. The data is always available to the Project Manager, who is responsible for the internal auditing. The technical team prepares the final monitoring report for the VVB and Verra, which is checked by the Project Manager.

**The organisational structure, responsibilities and competencies**

The Project has a multi-stakeholder proposition wherein different groups of people carry out different tasks. Here we make a differentiation between the organisational layer and the operational layer. The organisational layer is responsible for all coordination, procedures and the certification in general. The operational layer is responsible for all the field work, ground truthing and daily maintenance. The Green Branch will be responsible for the overall coordination and communication between all parties. They have appointed all actors their responsibilities and guidelines for how to properly fulfil these. These are written down in an internal guide for maintenance, monitoring and reporting referred to as the TGB Monitoring Manual. All actors and their activities are shown in Figure 10. Below the figure there is a short explanation of every actor.

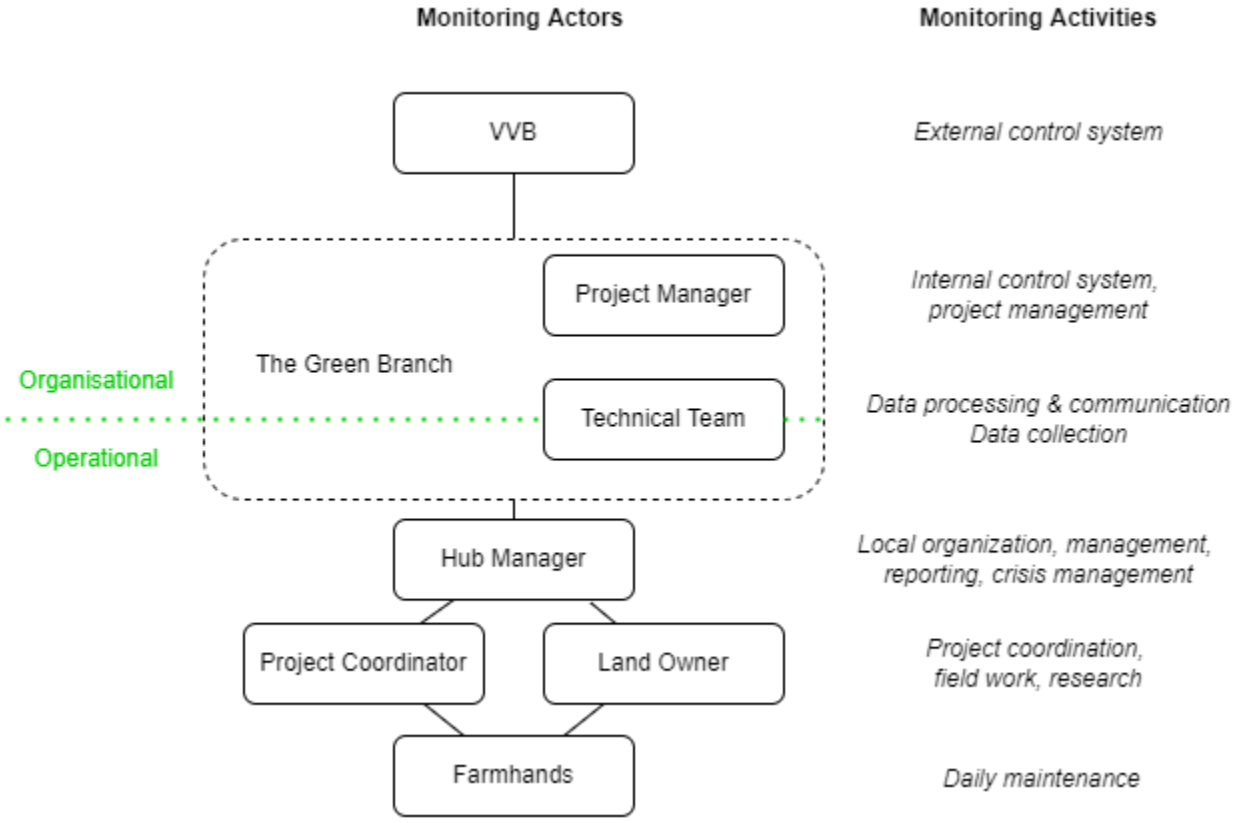


*Figure 10: Organizational structure of monitoring activities*

The responsibilities of each actor bottom-up:

**Farmhands**: They take care of the day-to-day activities on the farm and the forests. The farmers have been educated about the project and are in possession of the TGB Monitoring Manual. They do not bear responsibility for the biomass estimation monitoring but are asked to report fire and grazing incidents, monitor fences and firebreaks and abnormalities in the project areas, as instructed by the Adaptive Management Plan.

**Landowner**: Oversees the project and follows the arrangements that are stated in the contract with The Green Branch (Service Provider):

A. The provision of access to the Site at all times for the Service Provider and its affiliates (upon prior written notice of three days);
B. On the best-efforts basis, cooperation in executing the Business Proposal throughout the Project's lifetime;
C. On the best-efforts basis, the provision of accurate data and cooperation in deploying the Monitoring Plan;
D. The obligation to not deviate from the Project outlines without prior written consent from the Service Provider;
E. On the best-efforts basis, the provision of information to the Service Provider on all and any developments on and surrounding the Landowner's farm;

**Project Coordinator:** They are in service of The Green Branch and have extensive knowledge and experience in forestry in the area. They deliver input for co-creating projects in the area and are specifically trained for the monitoring and reporting. Because they have scientific knowledge and academic capabilities, they can be trusted to deliver high quality monitoring data. They also report on other ecological values and SDGs. The project coordinators are also in charge of research and experiments in the field.

**Technical Team:** The technical team is responsible for monitoring of tree biomass growth in the field and subsequent estimation of carbon stock based on the applied CDM methodology and tools. Hence, they are working on both the operational and organisational side of TGB. The team has academic backgrounds to ensure scientifically sound monitoring, data processing and management. Beyond these activities, the technical team is carrying out scientific research and is responsible for the VCS and CCB certification process and documentation.

**Hub Manager**: The Hub Manager is in service of The Green Branch and is responsible for the local management and coordination of a multitude of projects in the area. He oversees all arrangements with the landowners and Project Coordinators and is the direct line with The Green Branch head office in the Netherlands. The Hub Manager is the head of the local team and can act upon emerging issues on site.

**The Green Branch:** TGB is the project proponent with its headquarters situated in the Netherlands. The team is responsible for the project design and implementation, legal activities, financing and sales, certification, the monitoring manual and the final monitoring report.

**Project Manager:** The internal audit to cross-check for mistakes and omittances is done by the technical team manager, who is mainly situated in the Netherlands. This Internal Audit will follow the procedures explained in section “Procedures for internal auditing and QA/QC” of this chapter. The Internal Audit will also communicate any non-conformances with the validated monitoring plan and report on policies and accountability.

**VVB**: The Validation and Verification Body will be the intermediate between Verra and The Green Branch. They will check the monitoring report on its completeness and accuracy to receive certification.

As an addition to check for wildfires, deforestation alerts and trends in the surrounding area, TGB makes use of Global Forest Watch. This allows ‘real time’ monitoring and checking for red flags to be able to act quickly if needed.

**The policies for oversight and accountability of monitoring activities**

The policies for oversight and accountability are stated as follows:

A. Everyone who is responsible for
    a. Measuring
    b. Recording
    c. Processing
    d. Storing
    e. Aggregating
    f. Collating
    g. Reporting

of the data and parameters has third-level education or has followed specific training by someone from the project staff.

B. Data and parameters are being checked at different stages, namely:
    a. By the Project Coordinator during and after measurements;
    b. By the Hub Manager before they are submitted into the dashboard;
    c. By the Project Manager during the internal auditing and QA/QC;
    d. By internal or external remote sensing monitoring.
C. The Monitoring Manual will be given to all actors as well as training on how to perform the monitoring activities. Every crediting period there will be a refresh training.
D. The Green Branch, as project proponent, will be ultimately responsible for every monitoring report or handling non-conformances.

In addition, The Green Branch developed an Adaptive Management Plan, which is continuously updated as the project evolves. This document uses the PDD and TGB Monitoring Manual as foundation. The goal is to systematically develop new insights and make a resilient guide for future governance. The goals of the Adaptive Management Plan are:

A. Make a conceptualization of the system with real input;
B. Set quantifiable restoration goals and manage expectations;
C. The preferred processes of decision-making;
D. Clearly defined feedback mechanisms to learn from development and improve management.
E. Describe all the activities and processes related to the tending of the project area after the implementation of a project.
F. Ensure that the proponent has proper procedures in place in order to minimize the probability of project objectives being compromised due to ecological risks, climatic stresses, human malevolence or other harmful eventualities
G. Serves as a framework for recording, storing and reporting all the gathered information.

**The procedures for internal auditing and QA/QC**

The project shall use the QA/QC principles from chapter 8 “Quality Assurance and Quality Control” of the “IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories”.

Also, TGB has embedded the following safeguards:

A. TGB Monitoring Manual;

B. Internal Auditing;
C. Extra monitoring through satellite imagery and GIS;
D. Training of staff;
E. Education of farmers and landowners.

The Internal Audit shall be performed by the Project Manager of TGB, who has oversight of all projects and guarantees its accountability. The Internal Audit consists of:

A. Verification of the data;
B. Review of all monitoring reports;
C. Approving and delivering the final monitoring report;
D. A review of all documents;
E. Cross checking all calculations;
F. Checking if all policies and procedures have been followed correctly.

**The procedures for handling non-conformances with the validated monitoring plan**

Non-conformances can be checked in the operational and organisational layer. In the operational layer, non-conformances should be detected by the Technical Team and Project Coordinator when performing the monitoring procedures. In the organisational layer, non-conformances should be detected by TGB's internal audit. When these non-conformances are found, the origin of the errors is researched to enable determining next steps and proposing a solution. Potential non-conformances and their origin:

A. The non-conformance is a measurement error: The measurements will be done again with the TGB Monitoring Manual until they are done correctly and provide accurate measurements.
B. The non-conformance is a calculation error: The Project Manager and the technical team will redo the incorrect calculations until all non-conformances are omitted.
C. The non-conformance is a procedural error: When the validated monitoring plan is unable to be executed for any reason, may it be force majeure or an operational/organisational fault, this will be communicated with the VVB and Verra. If necessary, TGB shall prepare a revisited monitoring plan and submit a request for a deviation.

**Any sampling approaches used, including target precision levels, sample sizes, sample site locations, stratification, frequency of measurement and QA/QC procedures**

The calculation of the number of sample plots is based on AR-Tool 03: "Calculation of the number of sample plots for measurements within A/R CDM project activities". For each ground truthing location, the technical team computed a random point that represents the forest stand. The plot should have a minimum size of 10m x 10m. The stratification will be re-assessed at each biomass monitoring event to assure covering the biomass distribution represented by the planted forest. The field measurements and QA/QC procedures will be done before every verification event.

### 3.3.4 Dissemination of Monitoring Plan and Results (CL4.2)

Verification documents such as the monitoring report will be published online in the Verra Registry. Additionally, the project proponent will prepare summaries of the project documentation, including description and monitoring results, for communities and other stakeholders.

## 3.4 Optional Criterion: Climate Change Adaptation Benefits

### 3.4.1 Regional Climate Change Scenarios (GL1.1)

Current and future climate scenarios are mostly represented by global climate models (GCM), which simulate how the major climate system components (atmosphere, oceans, cryosphere, land and vegetation) interact. Future climate is predicted for four different greenhouse gas emission scenarios by the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC AR5): RCP2.6, RCP4.5, RCP6.0, and RCP8.5, named after Representative Concentration Pathways (RCP) with the number tags referring to different radiative forcings that could be reached by 2100, based on long-term anthropogenic behaviour scenarios.

Alvares et al. (2021) analysed potential climate change in South America based on two downscaled GCMs (HadGEM2-ES and MEROC5) for two GHG scenarios (RCP4.5 and RCP8.5). The first emission scenario (RCP4.5) is considered moderately optimistic, whereas RCP8.5 is the most pessimistic. The climate analyses were done for the following time-periods: 1961-1990 (baseline), 2011-2040, 2041-2070, and 2071-2099. Climate scenarios are presented based on the ensemble approach of the HadGEM2-ES and MEROC5 models to account for uncertainties from a single source of simulated data. Predicted changes in air temperature and rainfall are discussed in the following, as they represent key components of the general state of a region's climate system.

**Precipitation**

Both RCP scenarios show a decrease of rainfall for most of the northern part of South America, but an increase of rainfall over time for the South of Brazil, where our grouped project is located. In RCP4.5, the southernmost state of Brazil, Rio Grande do Sul, achieves an increase in precipitation of up to 500 mm/year within the three future periods studied, while in RCP8.5 even stronger differences of up to 700 mm/year more precipitation are predicted (Alvares et al., 2021, see Figure 12 and Figure 13). The estimated increase sets forth the positive trend in precipitation over the 1890-1984 period in the Pampas region, as analysed by the IPCC (Mata & Campos 2018). Wetter climate for the Southeast of South America (SESA) region was also found by several other studies (Groisman et al., 2005; Haylock et al., 2006; Re and Barros 2009; Marengo et al., 2010; Donat et al., 2013; Vera and Díaz 2015; de Barros et al., 2017; Wu and Polvani 2017; Dunn et al., 2020). Regoto et al. (2021) analysed precipitation extremes in Brazil, the results show a significant upwards trend in these extreme weather events in the South of Brazil. The analysis confirms the trend toward a wetter climate paired with shorter droughts in the region, especially in the spring months.

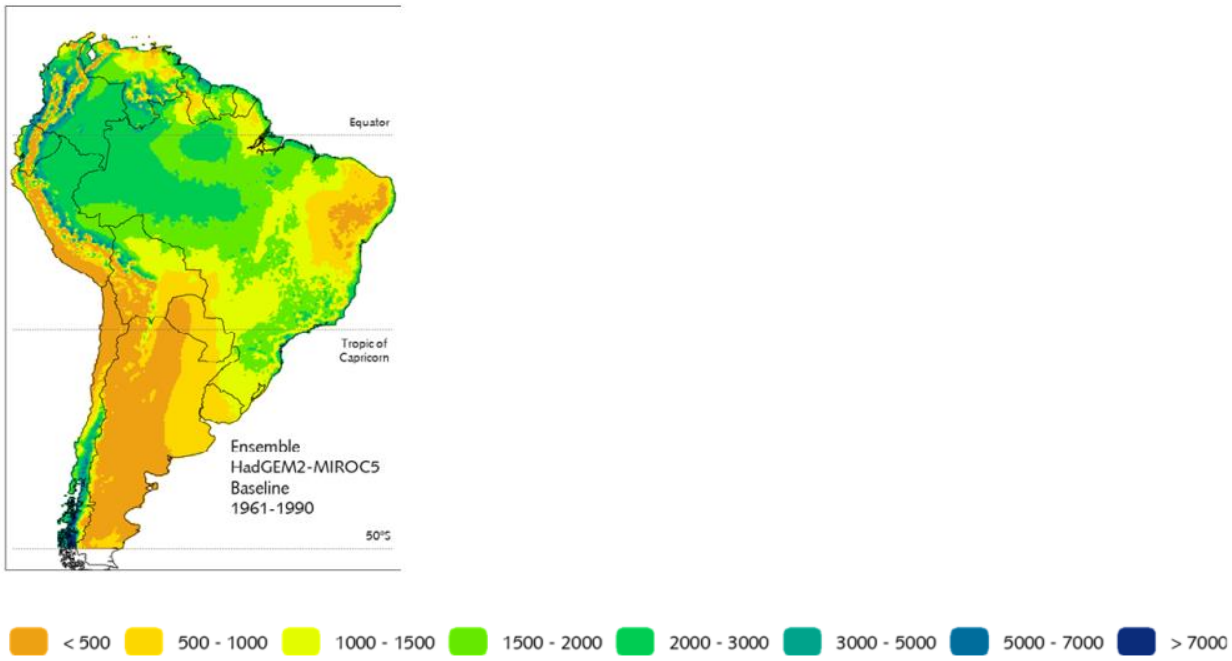


*Figure 11: Mean annual rainfall (mm/year) for South America estimated by the ensemble of HadGEM2 and MIROC5 models for the present time (baseline 1961-1990) (Figure from Alvares et al., 2021).*

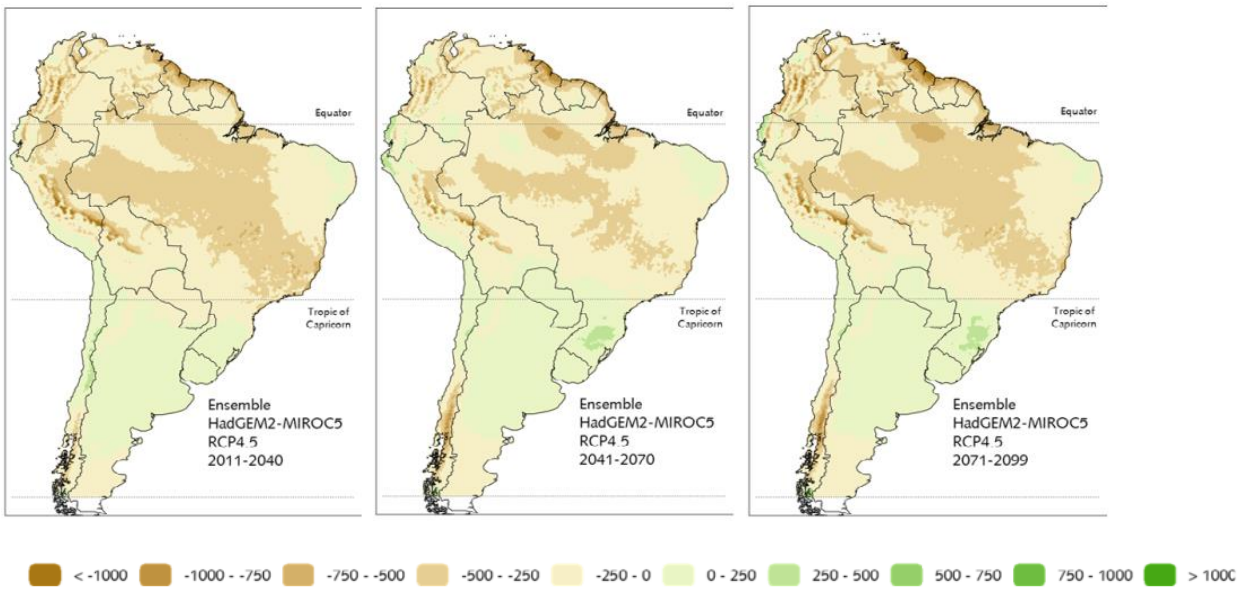


*Figure 12: Difference of annual rainfall (mm/year) between future (2011-2040, 2041-2070, 2071-2099) and present (1961-1990) periods for South America, estimated for RCP4.5 by the ensemble of HadGEM2 and MIROC5 models (Figure from Alvares et al., 2021).*

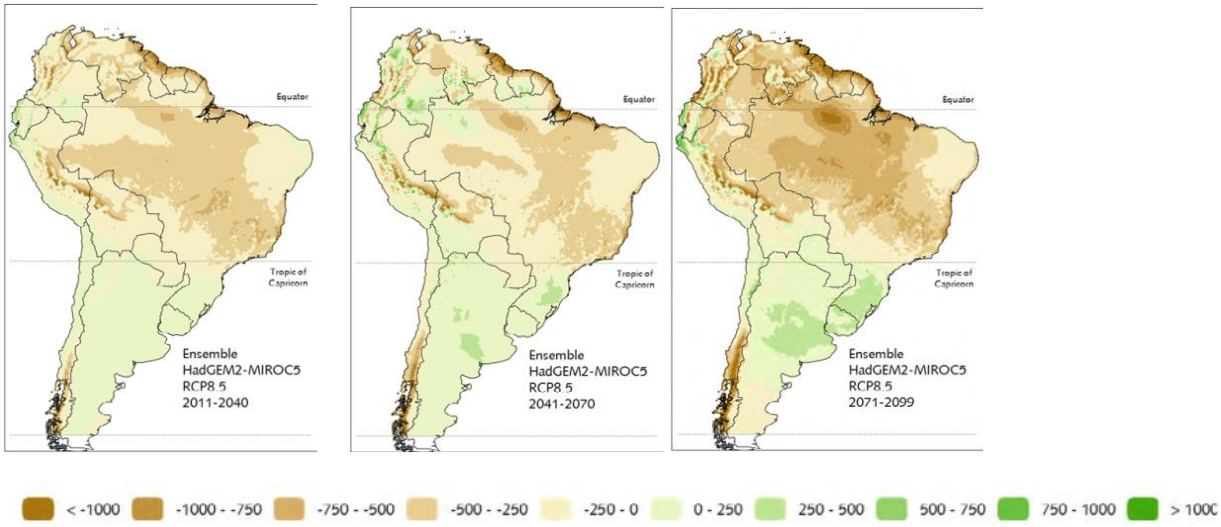


*Figure 13: Difference of annual rainfall (mm/year) between future (2011-2040, 2041-2070, 2071-2099) and present (1961-1990) periods for South America, estimated for RCP8.5 by the ensemble of HadGEM2 and MIROC5 models (Figure from Alvares et al. 2021).*

**Temperature**

Simulating the potential change in mean annual 2-m air temperature, the models predict a significant impact of global warming on all countries of South America. The temperature increment at the grouped project area is 1-2°C under RCP4.5, whereas RCP8.5 predicts a rise of up to 4°C for the same region. Regions in the northern and central parts of South America could face temperature rises of up to 7°C within the 21st century under RCP8.5 (see Figure 15 and Figure 16). Regoto et al. (2021) investigated changes in climate extremes over the last decades (1961-2018) in Brazil. The study results show a generalised warming of both warm and cold weather extremes across all seasons and regions. However, southern Brazil showed the least extent of these warming trends within the country.

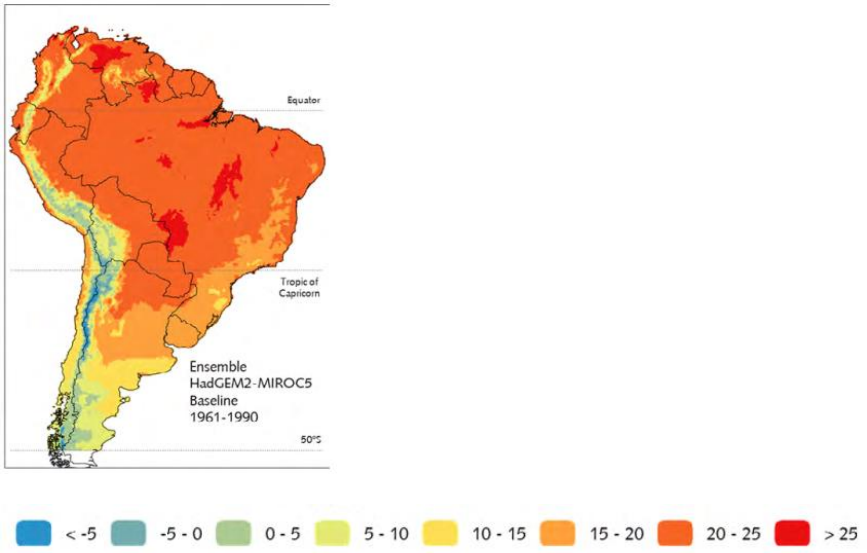


*Figure 14: Mean annual 2-m air temperature (°C)for South America estimated by the ensemble of HadGEM2 and MIROC5 models for the present time (baseline 1961-1990) (Figure from Alvares et al., 2021).*

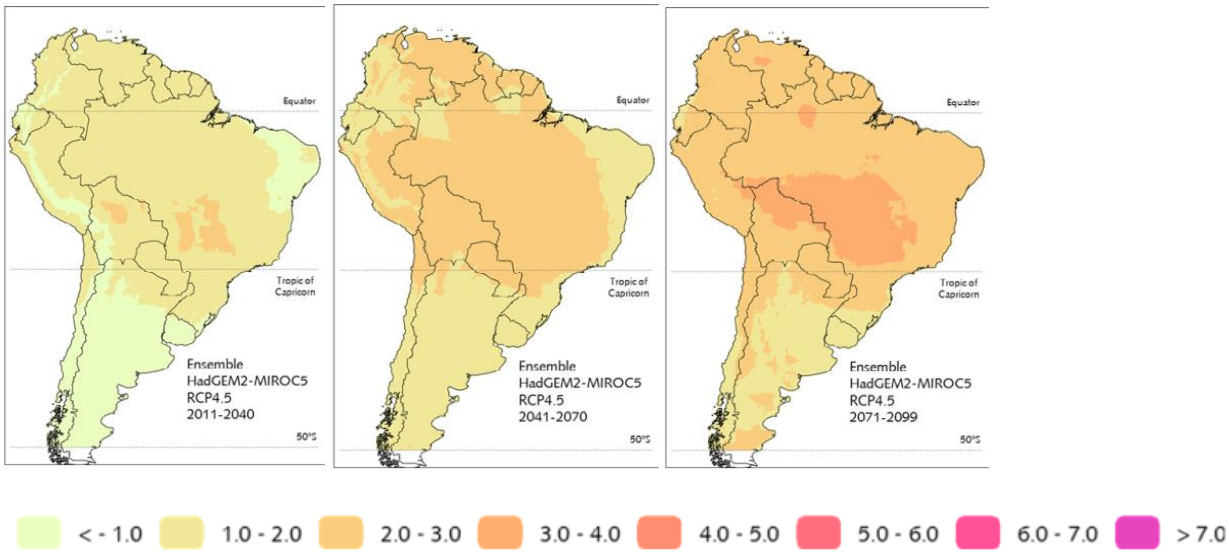


*Figure 15: Difference of mean annual 2-m air temperature (°C) between future (2011-2040, 2041-2070, 2071-2099) and present (1961-1990) periods for South America, estimated for RCP4.5 by the ensemble of HadGEM2 and MIROC5 models (Figure from Alvares et al., 2021).*

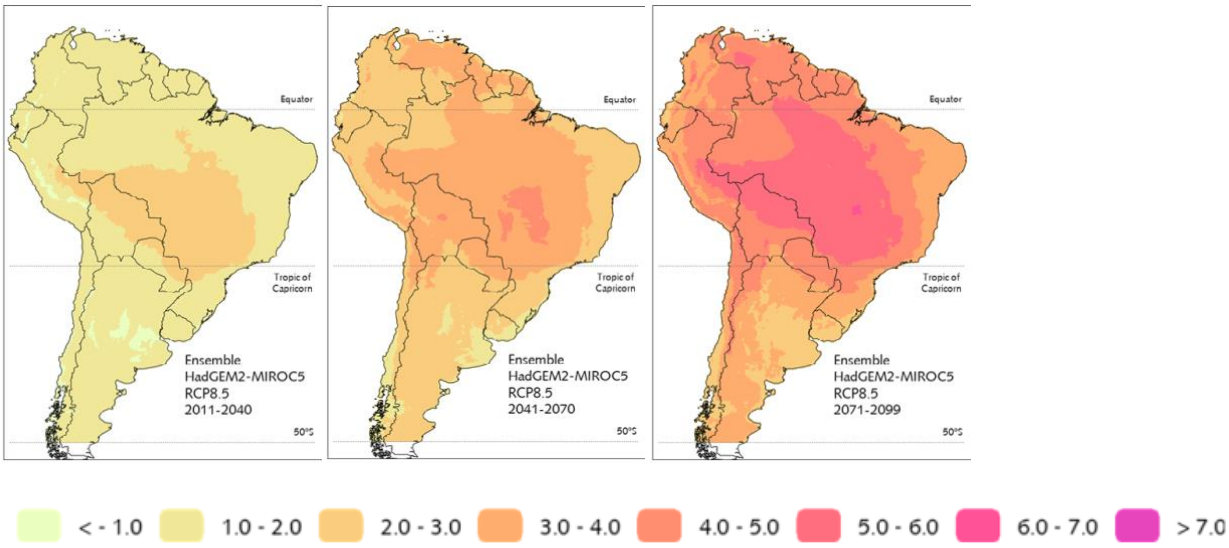


*Figure 16: Difference of mean annual 2-m air temperature (°C) between future (2011-2040, 2041-2070, 2071-2099) and present (1961-1990) periods for South America, estimated for RCP8.5 by the ensemble of HadGEM2 and MIROC5 models (Figure from Alvares et al., 2021).*

**Impact of climate change scenarios on land use**

The increase in extreme weather events such as heat waves and heavy rainfall in Rio Grande do Sul enhance the risk of forest fires and landslides, respectively. Environmental imbalance also reduces natural enemies of insects and supports pest outbreaks which could considerably threaten forest plantations and crops such as soy fields. Yield losses due to extreme weather events lead to more land having to be used for food production. Furthermore, the agricultural systems have changed dramatically with a worldwide trend towards simplification, with the prevalence of monocultures and expansion of livestock, while at the same time using large amounts of inputs such as fertilisers and pesticides to increase yields. Such land use practices contribute to the destruction of natural habitats, reduce biodiversity and promote soil erosion. The consequences are not only a loss of food security and negative impacts on human health, but also an impairment of the resilience of agricultural systems (PBL Netherlands Environmental Assessment Agency, 2017).

### 3.4.2 Climate Change Impacts (GL1.2)

**Community well-being**

A study from the World Bank about impacts of climate change on agricultural production in Brazil suggests that until 2030 the southern region of the country could lose up to 5 million hectares of fertile land due to climate change. In terms of the total area available and suitable for agricultural activities, which is the sum of the areas covered by natural vegetation suitable for production and the land currently used for these activities, the south of Brazil will be the most affected region of the country in all climate change scenarios (Assad et al., 2013). The populations living in those areas already usually suffer from floods and landslides and will increasingly experience these types of natural disasters, precisely because of the

increase in intense precipitation (Regoto et al., 2021). The majority of the soil loss is expected to be allocated in pasture areas.

Furthermore, due to climate change the communities living in southern Brazil are facing a reduction in ecosystem services such as functional biodiversity needed to maintain food production in current agriculture areas (Assad et al., 2013).

The reduction in land suitable for agriculture and the loss of productivity can possibly be compensated for by intensifying land use, requiring investments in production systems. When compared to large-scale agricultural producers, smallholders are generally more vulnerable to economic and environmental shocks, as well as having access to fewer resources to adapt to climate variation and change.

As a result of the intensification of agriculture, food prices are expected to rise, hitting the poorest population in particular in terms of food supply. Beef prices, for example, are expected to rise by more than 25% in all climate change scenarios (Assad et al., 2013).

**Biodiversity conservation status**

According to the IPCC report for Central and South America, climate change is expected to accelerate species extinction. In Brazil, some bird and plant species are assumed to move towards the south of the country, facing rare natural habitats due to high deforestation and grassland conversion rates. Land use change in terms of extensive and intensive agriculture is a driver of anthropogenic climate change, often resulting in deforestation and land degradation. These practices are affecting fragile ecosystems and are a main cause of biodiversity loss (Magrin et al., 2014).

The Pampa Rio de la Plata grasslands biome provides a habitat for 4000 native plant species, 300 species of birds, 29 species of mammals, 49 species of reptiles and 35 species of amphibians, of which most of the plant species are endemic to the region. Boldrini et al. (2009) classified 58 of the plant species in Rio Grande do Sul as ‘endangered’, 46 as ‘vulnerable’, 39 as ‘critically endangered’ and 6 as ‘apparently extinct’. The study of Modernel et al. (2016) showed that grazing regimes with high stocking rates and low forage allowances are having negative effects on plant, bird and mammal diversity. These results call for new models of livestock management to both cover the demand for beef and preserve biodiversity and ecosystem services in the Pampas (Modernel et al., 2016).

### 3.4.3 Measures Needed and Designed for Adaptation (GL1.3)

Amongst others, missing knowledge and economic capacity are keeping communities from transitioning to sustainable land use models. This chapter describes TGB project measures that support communities and biodiversity in climate change adaptation and resilience.

Measures to assist communities in adapting to impacts of climate change:

- Employment of local workers and training them in ARR techniques. Thereby TGB is increasing local welfare and community knowledge on sustainable land management.
- Sharing knowledge and initiating discussions about the sustainability impact of ARR projects and alternative land management models in stakeholder consultations.
- Educational opportunities for schools and universities through organising field trips and supporting research about and in the project location.
- Purchasing seedlings of native tree species from local nurseries and forming partnerships with local restoration initiatives to stimulate the local restoration market and contribute to the creation of a local restoration movement.
- Showing landowners an alternative source of economic income through sustainable land use practices.
- Creating a regional flagship example in native afforestation and reforestation, promoting sustainable land management systems.

Measures to assist biodiversity in adapting to impacts of climate change:

- Planting a diverse set of native tree species improves their habitat cover and the provision of ecosystem services related to biodiversity, soil and water.
- Collaborations with academic and scientific entities for research on native fauna and flora species in both grassland and forest areas, and ARR management.
- Long-term monitoring of forest cover and biodiversity.
- Process of ecological succession is enabled as a diverse set of seedlings are planted and maintained to survive and grow to a native forest.
- Soil health and structure are improved as impacts of pressures and threats on soil and vegetation are minimised and soil is enriched through promotion of a diverse vegetation.

# 4 COMMUNITY

## 4.1 Without-Project Community Scenario

### 4.1.1 Descriptions of Communities at Project Start (CM1.1)

All community members and groups were identified following the procedures described in SBIA part 2 (2011) and CARE (2002), as mentioned in section 2.1.8 and 2.1.9.

The zone of the grouped projects covers the Pampa biome in the south of Brazil. There are no communities or indigenous families that live or rely on land inside the area of the project. In sum, the relevant community groups identified for the grouped project are:

- Landowners
- Workers
- Suppliers
- Students of local university

Usually, the **landowners** of large properties live in cities, and from there, they have workers to manage the labour with livestock and crops. Their workers live on the farms, as smallholders in the region do. Smallholders plant for subsistence and raise sheep and cattle. Families consist of elderly, adults and young people. In general, the residents around the project area maintain a traditional and simple way of life that has been maintained and transmitted from generation to generation, having *Gaucho's* festivals like rodeos, "bingos", and "bailes" as leisures.

The group of people that work in the implementation are from another city in Rio Grande do Sul, named Encruzilhada do Sul. The majority used to work at watermelon cultivations, especially in the harvesting phase in summer, and in "tree/bush cutting" (eucalyptus, acacia and pine) in winter. In addition, some used to work as servants. Their perspective about employment in their previous occupation is changing because big wood and cellulose companies quit planting in the region, and because farmers are increasingly getting more concerned about the climate and so investing less in crops. The **workers** are men from 18 to 35 years old, 30 years old on average, who have received higher education. Most already have children.

The **suppliers** of projects` inputs are local companies or cooperatives. The largest supplier of the seedlings is a smallholder cooperative founded more than 30 years ago, which today counts more than 350 members. The cooperative deals with seed and grain reception, drying and storage, and has a tree nursery for the production of native and exotic seedlings. An environmental restoration project took place in the region in 2015 in which the cooperative worked together with local landowners.

The **students** of the local university are mostly *gauchos*, coming from the surrounding cities. The curricular activities of the Biological Sciences course include professional internships in the environmental, health and biotechnology areas, practical classes in laboratories, monitoring experiences, participation in events in the area of biological education, participation in teaching, research and extension projects.

### 4.1.2 Interactions between Communities and Community Groups (CM1.1)

The project is being developed on private land, with no groups living inside. No relevant interaction exists between community groups described in 4.1.1.

### 4.1.3 High Conservation Values (CM1.2)

The guideline used for identification, management and monitoring of high values are the Common Guidance for the Identification of HCV (Brown et al., 2013). Identification was made together with the representative of the community groups interviewed through a Rapid Rural Assessment process. RRA with community groups revealed no high conservation values related or indispensable to the community inside the boundaries of the first project instance.

*Table 14: Community High Conservation Values*

| | |
|---|---|
| High Conservation Value | HCV 4 (ecosystem services): Identified HCV areas are important for water flow regulation and erosion control. |
| Qualifying Attribute | HCV areas provide the environmental functions of preserving water resources, the landscape, geological stability and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil and ensuring the well-being of human populations. Provide basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes'. |
| Focal Area | Forested Permanent Preservation Areas (APP) designated by law inside the project zone. |

| | |
|---|---|
| High Conservation Value | HCV 6 (cultural values): Identified HCV areas are important for cultural value preservation. |
| Qualifying Attribute | HCV areas provide scenic beauty, recreational opportunities, and enhance cultural use values for the gaucho people. HCV areas preserve streams that feed in the Camaquã river. Such areas are critical for water discharge regulation of the streams and their protection from sediment erosion. In turn, the Camaquã river is particularly important for the local people in terms of cultural identity, recreation and aesthetic information. |
| Focal Area | Forested Permanent Preservation Areas (APP) designated by law inside the project zone. |

However, through data analysis, certain areas of High Conservation Values have been identified due to their ecological significance and importance for local culture, landscape preservation and ecosystem services. In addition, the sites provide scenic beauty, recreational opportunities, and enhance cultural use

values for the local gaucho people. The guidelines used for identification, management and monitoring of high values are the Common Guidance for the Identification of HCV (Brown et al., 2013).

Patches that are predominantly forested within the project zone and are protected by legislation have been identified as HCV areas. These areas are designated as Permanent Protection Areas (Área de Preservação Permanente - APP) by national legislation under Law no. 12.651/2012. According to this law, '*Permanent Preservation Area is a protected area, covered or not by native vegetation, with the environmental functions of preserving water resources, the landscape, geological stability and biodiversity, facilitating the gene flow of fauna and flora, protecting the soil and ensure the well-being of human populations*' (Embrapa, 2022). APP areas inside project boundaries cover river banks, usually inside U-shaped valleys and are critical for erosion control, water flow regulation and river discharge. Based on these attributes, such areas have been classified as HCV considering 'HCV 4: Ecosystem services'. An area can be considered as an HCV 4, if it relates to '*basic ecosystem services in critical situations including protection of water catchments and control of erosion of vulnerable soils and slopes*'. Services that are relevant in the case of APP areas in our project zone are Protection of water catchments and Control of erosion of vulnerable soils and slopes. The capacity (as well as the importance) of these areas to provide the aforementioned services is confirmed by their designation as APPs since (according to the related legislation) such attributes are essential for their designation.

HCV areas preserve streams that feed in the Camaquã river. Such areas are critical for water discharge regulation of the streams and their protection from sediment erosion. In turn, the Camaquã river is particularly important for local communities in terms of cultural identity, recreation and aesthetic information. Therefore, the same areas have been identified as HCV 6: Cultural values, due to their relationship (hydrological) to the culturally significant Camaquã river.

The total aerial extent of APP inside the boundaries of the first project instance, covers 96.6 hectares and is illustrated in Figure 17.

The project aims to preserve good ecological conditions inside HCV areas and to safeguard their ability to provide critical ecosystem services. Furthermore, the project is expected to have positive effects by ameliorating the pressure of grazing and minimising the risk of fire within HCV areas. Helping preserve the springs and APPs (discussed in 5.2.4) is an important focal area.

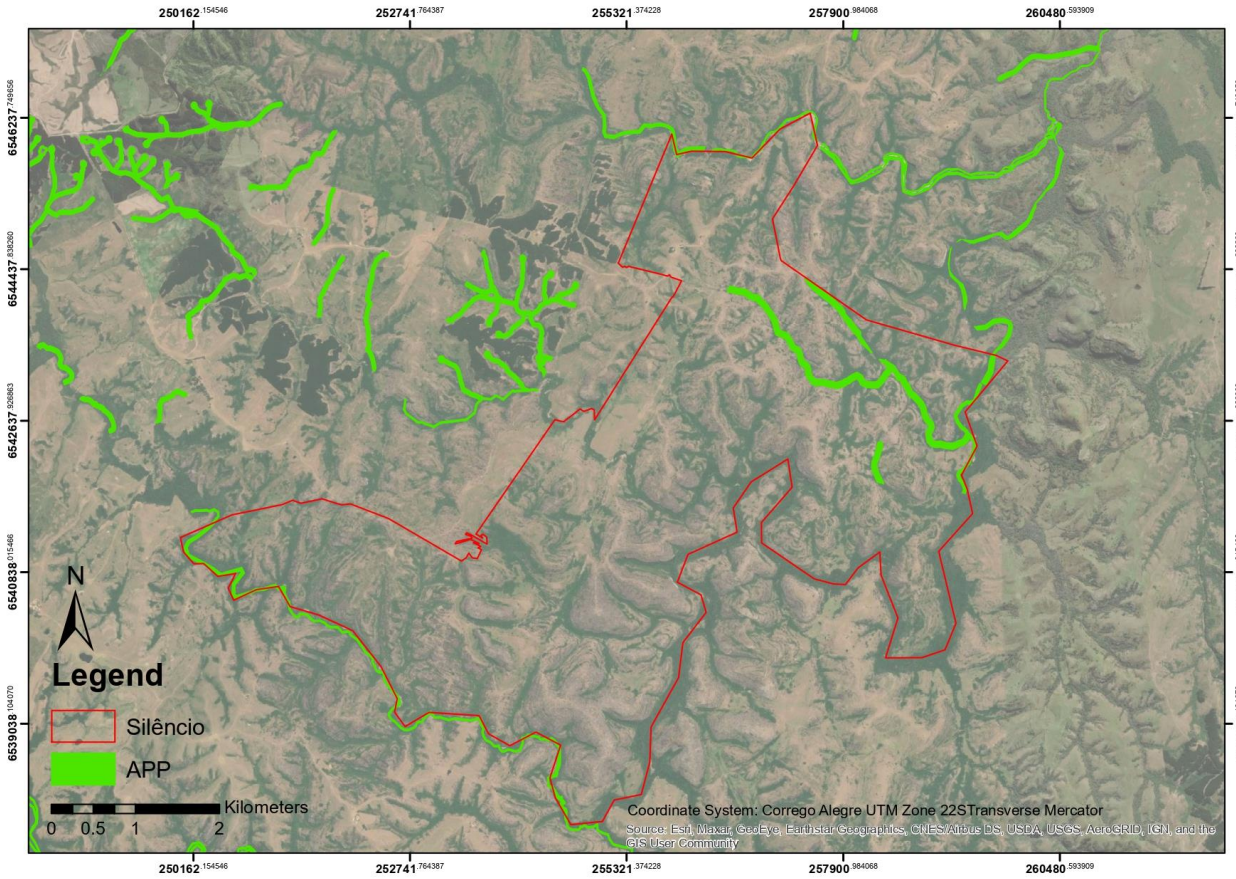


*Figure 17: Aerial extent of APP inside the boundaries of the project at Fazenda Silêncio*

### 4.1.4 Without-Project Scenario: Community (CM1.3)

Without the project, the land would continue to be used for grazing by domesticated herbivores. The frequent use of fire to clear the shrubland and woody plants remains as a common practice. Therefore, the landowner would stay in the same well-being condition with no potential increase in income. Furthermore, landowner's well-being will remain highly dependent on market fluctuations related to the prices of beef.

The current management (overgrazing and fire) is a major source of greenhouse gases, emitting more equivalent carbon units than can be stocked in the soil. Hence, without the project, community members would contribute to and drive GHG emissions in the project zone. It is worth mentioning that the region suffers from severe droughts. Healthy ecosystems close to cities can diminish natural catastrophes and make them more resilient to climatic events. That's due to the ability of well-functioning ecosystems (particularly forest systems) to retain water in the soil, regulate water discharge, flash flooding events and soil loss (read more in section 5.1.3).

Without the project the employment opportunities for local farmers will remain limited to conventional agriculture and commercial forestry jobs that have been on the decline in the past years. Moreover, the existing employment opportunities limit the potential of the local workforce to transition to

more nature-positive occupations. In turn, this creates a vicious cycle of environmental degradation in the region where harmful activities are perceived as the only way to make a living for the people working in the primary sector.

Furthermore, the stimulation of the local economy and restoration market that results from the acquisition of forestation materials, inputs and machinery would not occur. As a consequence, local community-led nurseries will remain focused in isolated, sparse restoration activities and partners dealing with machinery will keep working only with commercial agriculture and forestry clients.

## 4.2 Net Positive Community Impacts

### 4.2.1 Expected Community Impacts (CM2.1)

The part I and part II of the SBIA manual were used for guidance in identifying the impacts (Richards & Panfil, 2011).

| Community Group | Impact(s) | Type of Benefit/Cost/Risk | Change in Well-being |
|---|---|---|---|
| Landowners | Revenue from the land lease for 35 years | Actual direct benefit | Income stability |
| Suppliers | Income from supplying resources, planting materials and machinery. Different business opportunities from forest implementation and maintenance of machinery | Actual direct benefit | Increase in income and diversification of clientele |
| | Enabling the activation of a community-based nursery led by local people. | Actual direct benefit | Increase in income and economic dynamism. Enables continuation and scaling of economic activities. |
| Workers and their families | Job opportunities with more attractive salary | Actual direct benefit | Provision of income and diversification of economic livelihood opportunities |
| | Training on new technologies and techniques. Knowledge and education on sustainable land management. | Actual direct benefit | Improved knowledge about forests and acquisition of new |

| | | | |
|---|---|---|---|
| | | | technology skills as a result of the project activities |
| | Increase in employees' income | Predicted indirect benefit | Positive impact in family well-being |
| Students | Provision of educational opportunities, increase in environmental awareness and sustainable management. | Actual direct benefit | Understand the value of forests in preserving biodiversity and maintaining ecosystem services |

### 4.2.2 Negative Community Impact Mitigation (CM2.2)

The project is not expected to result in negative impacts on the community. There are no communities living inside nor are dependent on the project area.

However, as local people are used to the *gauchos* traditional work and lifestyle, which include cattle ranching and cultural practices related with livestock, there is the risk of aversion to the project. To prevent this from happening, we maintain an open conversion approach with the local community. Stakeholder consultation with neighbours is conducted and the feedback received is included in the project design. Furthermore, communities are informed about the project benefits related to nature (biodiversity, ecosystem services) and welfare (income opportunities, knowledge and education, environmental conditions). Open communication about the project and inclusion in the project activities limits the risk of not getting social approval.

The *gaucho* cultural values can be affected in the perception of some more conservative farm workers. Usually, the old *gauchos* that work in the farms have been raising livestock for their entire life. We assure they will continue their rural lifestyle and horse riding routine for monitoring the seedlings and to the cattle in the surroundings of each project site.

For the community sub-group of the landowner, although the project has affected his economic activity by altering the financial model of the farm from leasing for cattle ranching to leasing for carbon credits, there are no direct negative impacts as he favours the income stability that the project provides.

Mitigation measures for precaution and possible well-being negative impacts in local community that might appear include:

- Open-communication with workers and neighbours;
- Adaptive management;
- Monitoring the project impact through Participatory Rural Appraisal;
- Collaboration with local research institutions and environmental authorities.

In sum, switching the land management model from cattle ranching and/or commercial monoculture to restoration of forest elements does not result in unmitigated negative community impacts. On the contrary, project activities are expected to result in net benefits to local communities (see 4.2.3).

### 4.2.3 Net Positive Community Well-Being (CM2.3, GL1.4)

Overall, the project will have a positive net impact on the well-being of the community. As demonstrated in the previous sections, there are more benefits than there are impacts resulting from project implementation. Also, these benefits far outweigh any potential negative impacts.

A net positive impact will be accrued from project activities, such as income stability for the landowner, employment opportunities provided to residents of the region, development of projects with local departments to benefit neighbours, local involvement in maintenance and performance monitoring as well as opportunities for long-term study and education.

Most of the local groups and stakeholders had never heard about the carbon market and have limited awareness around forestation and sustainable land uses. Through the RRA survey it was found that everyone believes in a net positive impact.

The Green Branch collaborates with local universities, by providing internship and field work and research opportunities. Contact has been made with professors of the local university for presenting the project. Field work trips were organized by the proponent in 2021 to present the site for students of the Biological Sciences and Agronomy courses (Figure 18). On the occasion, students had the chance to identify plants and collect soil with a dutch biologist and a local agronomist.

*Figure 18: Field trip with students from the local university*

Furthermore, a partnership has been made with a group from the Biological Science course. The students are designing a project for monitoring the seedlings and identifying species of the fauna and flora of the project site. The activities are part of the project ‘Biota Pampeana’ which aims to identify, research and disseminate the value of biodiversity in the Pampa biome (https://sites.google.com/view/biota-

pampeana/p%C3%A1gina-inicial?authuser=6). The first field trip of the partnership occurred in April/2022 (Figure 19).

*Figure 19: Field trip the group of the Biological Science course which developed a project within the project site*

Moreover, the project has established a research collaboration with Universidade da Região da Campanha (URCAMP) focusing on native tree species. The proponent has donated seeds of native trees to the University where they will be tested for germination and survival under different conditions in a controlled environment. The research activities will be part of the curriculum for 5th grade students of the university and will generate important insights that can be used for the conservation of native species of the region.

Finally, we are also currently establishing a partnership with a women-led initiative from URCAMP that could provide us with native tree seedlings for the grouped project. A Memorandum of Understanding has been agreed upon, showing the goals of the collaboration: research to best practices to germinate and grow native species and scale the supply chain.The latter adds on to the community, cooperation and education benefits of the project which are especially related to women inclusion and participation.

### 4.2.4 High Conservation Values Protected (CM2.4)

The project's activities focus on accumulating carbon, preservation of the area and offering educational opportunities. It will improve soil, microbiology and atmospheric interactions; provide wood and fibre after the project is finished; and provide training experience for students and local workers, and so it will enhance and protect the sites identified to have HCVs. Thus, the project will protect and have a positive impact on the HCVs identified in section 4.1.3. The areas associated with HCVs relate to the provision of important ecosystem services as well as significant cultural values (see 4.1.3).

Positive effects on HCV areas will be attained through a reduction of grazing and fire pressures and with continuous monitoring of their condition. HCV area monitoring and protection is an important focal

point in the project's monitoring programme. The latter implies that particular attention will be given to such areas with regards to pressure reduction. The process is further elaborated upon in sections 5.2.4 and 5.4.1.

## 4.3 Other Stakeholder Impacts

### 4.3.1 Impacts on Other Stakeholders (CM3.1)

GOVERNMENT AGENCIES

The proponent is exploring the possibility of developing private-public projects with FEPAM (State Foundation for Environmental Protection, *Fundação Estadual de Proteção Ambiental Henrique Luis Roesseler/RS,* in Portuguese) and EMATER (Institute of Technical Assistance and Rural Extension, *Instituto de Assistência Técnica e Extensão Rural,* in Portuguese). These organisations are interested in such a potential since the project is novel in the region and offers the opportunity for innovative projects.

The school mentioned in 4.1.1, in which the neighbourhood children study, has always been involved in community work on behalf of the region's residents, such as medical and dental assistance, vaccination, and lectures, under the help of EMATER. For this reason, the project proponent has been in contact with an agricultural technician from the regional agency for developing future social projects together which adds on to the positive community welfare impacts of the project.

Furthermore, contact was made with the forestry engineer researcher of EMBRAPA (Brazilian Agricultural Research Corporation, *Empresa Brasileira de Pesquisa Agropecuária,* in Portuguese). The project, because of its distinct focus on local biodiversity improvements, is expected to create new opportunities for scientific research with local students in a relatively understudied ecological region.

LOCAL INHABITANTS/FARMERS

Are not negatively influenced by the project directly and can even be involved in maintenance and monitoring. Locals are usually keen on a project that generates more income and stability than their current activity.

AGrUPa

The Associação para Grandeza e União de Palmas - AGrUPa, an NGO working in nature conservation and sustainable development in the region, has been contacted by the proponent and has been informed of the project scope, planned activities and expected impacts. The association is a keen enthusiast of the project and is interested in remaining involved in the stakeholder engagement process. As the establishment of mining companies is increasingly threatening community groups that live close to the project area, AGrUPa is happy to see a scalable project that works towards nature conservation in the region.

### 4.3.2 Mitigation of Negative Impacts on Other Stakeholders (CM3.2)

No negative impacts are foreseen on other stakeholders described in 2.1.9 as demonstrated in section 4.3.1. Through continuous open communication with other stakeholders, a plan will be developed and implemented to mitigate any unforeseen negative impacts.

### 4.3.3 Net Impacts on Other Stakeholders (CM3.3)

Negative impacts by project activities have not been identified and, therefore, the net impacts on the well-being of other stakeholders are expected to be positive overall.

## 4.4 Community Impact Monitoring

### 4.4.1 Community Monitoring Plan (CM4.1, CM4.2, GL1.4, GL2.2, GL2.3, GL2.5)

The part I and part II of the SBIA manual were used as guidance while creating the TGB impacts monitoring plan (Richards & Panfil, 2011). The TGB community monitoring plan will be used to assess the employment and well-being data, monitored on a yearly basis or every verification period, for tracking the socio-economic changes of employees, suppliers, landowners and local people involved. Some indicators evaluated are shown, but not limited to the table below.

*Table 15: Community monitoring indicators*

| Social-economic indicator | Affected community groups | Variable | Measurement method | Frequency | Climate Gold |
|---|---|---|---|---|---|
| Total number of people employed throughout the project implementation | Workers | jobs created | TGB database | Anually | X |
| Total number of people employed throughout the project lifetime | Workers | jobs created | TGB database | Every 5 years | |
| The total number of community members (workers) who had improved knowledge and techniques as a result of the project activities | Workers | people trained | TGB database | Anually | |
| Total number of people indirectly employed by purchasing seedlings from local nurseries. | Suppliers | jobs created by suppliers | RRA methodology | Every 5 years | |
| Impact on women and children derived from the project | Workers and suppliers | family members | RRA methodology | Every 5 years | |

| | | | | | |
|---|---|---|---|---|---|
| Employee satisfaction rate | Workers | workers satisfied with working conditions | RRA methodology | Anually | |
| Ensure High Conservation Values | All | Grazing intensity & fire frequency | Continuous field monitoring of pressures | Anually | |
| Local landowner budget | Landowners | income increase | RRA methodology | Every 5 years | |
| Local landowner budget | Landowners | income stability | RRA methodology | Every 5 years | |
| Total number of people impacted by the increase in employees' income | Workers | family members | RRA methodology | Anually | |
| Students who understand the value of forests in preserving biodiversity and maintaining ecosystem services | Local students | number of students | TGB database | Anually | |
| Total number of people employed throughout the biodiversity monitoring and site maintenance phase | Local students and workers | jobs created | TGB database | Anually | |
| What changes have there been since the start of the Project? | All | subjective | RRA methodology | | |
| Which of these changes are attributable to the Project? | All | subjective | RRA methodology | | |
| What differences have these changes made to people's lives? | All | subjective | RRA methodology | | |

### 4.4.2 Monitoring Plan Dissemination (CM4.3)

The monitoring report(s) and the systematised results of monitoring will be posted on the VERRA website after every verification event. A TGB technical employee is in direct contact with the representatives of the community groups since the implementation design phase to ensure continuous and adequate communication, clarify doubts, acknowledge concerns and share updates.

## 4.5 Optional Criterion: Exceptional Community Benefits

### 4.5.1 Exceptional Community Criteria (GL2.1)

TGB puts landowners, farmers and the local community at the centre of the projects. By providing capital, access to a supply chain of biodiverse planting material, technical assistance and connecting them to the international carbon market, the project can change their perspective on possible land use models and give them the necessary tools to become true nature conservationists.

The landowners, members of the community, have the right to access all land, as shown in item 2.5.2. Without the support and commitment of the landowners, it would not have been possible to acquire land to implement the project. Furthermore, 160 bee-hives will be arranged on the first project site to be managed by a community member, involving exceptional social and biodiversity benefits.

Community groups are involved in the supply chain, in nurseries and planting operations. Without local nurseries, it would not have been possible to supply the necessary quantities of native tree species. These species are not cultivated very much in a commercial setting and it is considerably difficult to purchase them in large quantities, unlike other commercial exotic species (such as eucalyptus, acacia and pine). As a result, the project would have to redefine its scope and objectives by planting species that are not native in the region. Moreover, without the local workers, it would have been particularly difficult to find labour force from other areas to carry out project implementation. Therefore, it would have been impossible to generate the related benefits to local communities. For these reasons, the activities of local community groups are indispensable for generating the climate, community and biodiversity benefits.

### 4.5.2 Short-term and Long-term Community Benefits (GL2.2)

The project will generate benefits both in the short-term and for generations to come, in the three spheres of sustainability, economy, society and environment.

Short term benefits for the different community groups include the income from rent and carbon credits for the landowner, increased income and diversified employment options for the workers, income for purchasing project resources and business opportunities for the suppliers and direct experiential education opportunities for the students of the local university.

Long term benefits arising from the project are for example the stimulation of a local land restoration market that can spur the implementation of other similar activities. This can create further business opportunities for the local suppliers and improve the availability and diversity of resources. Furthermore, the local workers with the training they will receive during their involvement in the project, can acquire valuable skills and knowledge which they can use for further employment activities and personal

development. In addition, the landowner will be able to make the difficult transition from a common revenue model of the land, to a sustainable, climate positive one. The trees with commercial values will create a sustainable business model and provide security and income to the landowner after the end of the project lifetime. With regards to research and education, the project will allow the long term study of native tree species in the field and enable knowledge creation related to ecosystem dynamics, development and responses to climate changes.

Tangible outputs from the implementation of the project will be the non timber forest products such as fruits, nuts and leaves with medicinal properties. Plus, the forest can mitigate environmental related risks (such as floods, droughts) and can provide windbreaks, improved soil and water quality.

Indirect benefits arise from education, the creation of a precedent of sustainable land management projects in the region, improved agricultural practices and leadership development.

### 4.5.3 Community Participation Risks (GL2.3)

Joining the TGB project is completely voluntary. There is no change of legal ownership rights in the project sites. Existing property rights are recognised, respected and supported. All landowners of the grouped project have signed the lease agreement giving their free, prior and informed consent to the full terms of the project and the potential costs, risks and benefits are discussed previously. They are required to participate in due diligence and attend meetings in order to stay informed about and involved in project activities.

To avoid low community engagement, extreme attention is given to assure local approval of the projects through various activities. Some examples include organising local events with stakeholders and community members, hiring local partners and employees, social media campaigns and others. Surrounding neighbours will get better pastures due to better water retainment. Also, there are a lot of people and organizations active in the region that want to protect the biome and its people. According to the PRA made with the representatives of the community group, they all think the TGB project is good for the environment and the people involved who get compensated for managing and monitoring the forest.

### 4.5.4 Marginalized and/or Vulnerable Community Groups (GL2.4)

*Table 16: Marginalized and/or Vulnerable Community Groups*

| | |
|---|---|
| Community Group 1 | Impoverished neighbours and workers |
| Net positive impacts | The project activities forecast actual and predicted, direct and indirect benefits, generating net positive impacts on the well-being of poorer households. The direct benefits are increased incomes, diversified employment opportunities, training on new technologies and techniques to workers, development and educational opportunities. |
| Benefit access | The risk of distance is addressed with transportation arranged and paid by TGB, as well as food and onsite housing. As a result, the vulnerable community group has direct access to the benefits of education, training, access to new skills and knowledge, income and employment. |
| Negative impacts | No negative impact was identified during the RRA for marginalized or vulnerable community groups. |

### 4.5.5 Net Impacts on Women (GL2.5)

TGB grants direct economic benefits to women, including access to leadership opportunities and indirect benefits to the women of the employees' families. The project does not create any negative impacts on women and thus the net impact is positive. For the future, with the plan to create a nursery based in the city of Bagé, more employment opportunities for women will be created. The proponent is currently establishing a partnership with a women-led initiative from URCAMP that could provide us with native tree seedlings for the grouped project. The program is being designed for female community members to have a key role in the supply chain of seeds and seedlings, and also in the agroforestry plot management and non-timber forest product exploitation.

### 4.5.6 Benefit Sharing Mechanisms (GL2.6)

The lease agreement specifies the distribution of costs and benefits between the private landowners and the project proponent. The Green Branch is responsible for all implementation costs including purchasing seedlings, site preparation, planting trees and maintaining the area. The private owner receives regular rental income as well as a share from the carbon credit income. Moreover, the landowner gains ownership of the trees after the 30-year lease period ends. In addition to direct payments, landowners receive 100% of the non-carbon benefits created from tree planting, such as sustainable forestry (only after the crediting period) and agroforestry revenues.

Community members who work with the proponent receive benefits in the form of income and employment, free transportation, meals and accommodation during project activities, and ongoing training with development opportunities.

Local community members who work in the partnering nurseries act as suppliers for project resources, specifically the seedlings of native tree species. With the project implementation, these people are able to perform their employment activities and sell their products.

In 2021, the local team members presented the project to representatives of the community that know the local context of the marginalized people around the project site, with the aim to find where TGB could focus regarding social benefits to the people who live around the project site.

All the above mentioned benefits are shared with their respective recipients in an open and transparent manner, since all related project costs are clearly defined and structured during implementation design. Purchases, invoices and related official documents are diligently stored and thus the claimed benefit transfer to each recipient can be demonstrated.

Regarding benefits to the students of the local university, implementation of the project provides the opportunity to do research, field trips and gain knowledge and education. The project site is a space where students can experience nature in person and apply their learnings from the university classroom out in the field. By engaging students in hands-on experiences and reflection, they are better able to connect theories and knowledge learned in the classroom to real-world situations. This is commonly known as experiential learning and can strengthen the passion of young researchers for the nature of their region.

### 4.5.7 Benefits, Costs, and Risks Communication (GL2.7)

The information about predicted and actual benefits, costs and risks were not only communicated but also agreed with representatives of community groups. That was made through Rapid Rural Appraisal and discussion, negotiation and signing of the lease agreement with landowners.

### 4.5.8 Governance and Implementation Structures (GL2.8)

The project proponent employs a mix of professionals with different backgrounds from Europe and Brazil, Rio Grande do Sul specifically, to ensure that all aspects of project management are met. The governance and implementation structures are based around the ‘hub’ concept and are shown below, including the company team and key stakeholders. Each stakeholder plays a specific role in the project and there is an adequate involvement and representation of local actors. Local representatives are part of the management team. Community members are allowed and encouraged to effectively participate in project decision-making and implementation of the carbon projects. Details of members of the management team and their respective roles are described in item 2.4.3. Self-governance or other structures used for aggregation of smallholders/community members are not applicable for this grouped project, since project activities do not take place in lands with various smallholder ownership.

### 4.5.9 Smallholders/Community Members Capacity Development (GL2.9)

The project is developing the capacity of community members and local institutions to participate effectively and actively in project design, implementation, management, and monitoring. The capacity development created by the project includes:

- management positions filled by locals from Rio Grande do Sul, Brazil;
- positions and roles occupied by women;
- management and operational positions filled by young staff;
- students from the local university are encouraged to participate in the monitoring phase. Students will develop a project of the biological Sciences course at the project site;
- Implementation is carried out by local partners employing local workers;
- workers are encouraged to learn to use new technologies and gain new knowledge;
- the local seed laboratory voluntarily carried out germination tests on the seeds of trees purchased by the proponent, allowing students and laboratory members to work with species that are relatively understudied.

# 5 BIODIVERSITY

## 5.1 Without-Project Biodiversity Scenario

### 5.1.1 Existing Conditions (B1.1)

The Pampa biome is situated to the south of RS occupying an area of 63% of the state (Roesch et al., 2009) and stretching down through Uruguay to Argentina. It contrasts sharply with the forests of the North, as the Pampas are characterized by their natural grasslands, interspersed with isolated trees and shrubs. According to Köppen, the climate of the region is Cfa type, i.e., subtropical humid. Mean annual air temperature ranges from 18–19 ºC, with mean annual temperatures of 24 ºC in the hottest month (January) and 14 ºC in the coldest month (July).It is considered a particularly important area for plants, since around 3,000 to 4,000 species are estimated to exist in the Southern Brazilian grassland environment (ibid). Pampas harbour a remarkable diversity of grasses since there are more than 450 herbaceous species. In natural grassland areas, composite and leguminous species (150 species) such as field aloe, native peanut and native clover also stand out (MMA, 2021). In the areas of rocky outcrops many species of cactus can be found, some of which are endangered. The biome is a habitat for different types of fauna species such as mammals, birds, reptiles and fish. The native fauna diversity is particularly rich, with almost 500 species of birds, among them the rhea (Rhea americana), the common parrot (Rynchotus rufescens), the partridge (Nothura maculosa), the quer-quero (Vanellus chilensis), the correndera pipit (Anthus correndera), the red-eared woodpecker (Furnarius rufus), the field thrush (Mimus saturninus) and the field woodpecker (Colaptes campestres). There are also more than 100 species of terrestrial mammals, including the pampas deer (Ozotoceros bezoarticus), the pampas fox (Pseudalopex gymnocercus), the pampas cat (Leopardus munoai), the Molina's hog-nosed skunk (Conepatus chinga), the ferret (Galictis whose), the Southern long-nosed armadillo (Dasypus hybridus), the Brazilian guinea pig (Cavia aperea) and several species of tuco-tucos (Ctenomys sp). The Pampa is home to a very rich ecosystem, with many endemic species such as: Tuco-tuco (Ctenomys flamarioni), the blue-tufted starthroat (Heliomaster furcifer) (MMA, 2021). Areas of importance for conservation of the flora and fauna biodiversity have been identified in the Pampa biome (Roesch et al., 2009).

Plant formations with trees are found mainly as gallery forests, ‘capões’ (islands of trees within the grassland) and shrub forests. ‘*Although the Pampa biome is frequently interpreted as a pure grassland environment, it comprises at least seven different physiographic formations: savanna, steppe, steppic-savanna, coast, transition areas and patches of seasonal deciduous and semideciduous forests’. ‘The characteristics of vegetation in the Pampas involve the coexistence between the phytogeographic type grassland-scrubland savannah and seasonal semi-deciduous forest and some small fragments of Araucaria moist forest’ (IBGE, 2007)*. The typical classifications of forest vegetation types identified in Rio Grande do Sul are: Dense and Mixed Ombrophilous Forest, Seasonal Deciduous and Semideciduous Forest, and areas of Pioneer Formations or Restingas (Jurnitz & Jarenkow, 2003). In South Brazil, the current warm and moist climate favours forest expansion processes over native grasslands in many physiographic regions, forming mosaic landscapes (Behling et al., 2009). In general, natural vegetation in the area tends to develop into sub-tropical forest in its climax succession stage, if left unmanaged (MMA, 2009). The current climatic conditions are suitable for the growth of forest and it is generally agreed that

human induced activities such grazing, and burning are the most important factors hindering the expansion of forest formations over these grasslands (Roesch et al., 2009).

In addition, the grouped project zone encompasses areas with special ecological characteristics, such as the Serra do Sudeste, an ecotone area in the transition zone between two important biomes: the Mata Atlântica to the north, and the Pampas to the south. The Serra do Sudeste is a forest-grassland ecotone zone (Matos et al., 2016) and as such, it is a valuable bridge between the two biomes, providing habitats for plants and animals from the Pampas and the Atlantic Forest alike. *'The* (natural) *vegetation type is grassland-forest mosaic with the presence of steppe, savanoid vegetation and semi-deciduous seasonal forest'* (Gomes et al., 2020). *'Ecotones are zones where adjacent ecological systems co-occur in space, supporting unique ecological dynamics. Grasslands occur on areas in both the Atlantic Forest and Pampa biomes and form mosaic landscapes with forests*' (Drose et al., 2019). An assessment of forest formations in Serra do Sudeste, revealed that species diversity was estimated as one of highest values recorded for seasonal forests in Rio Grande do Sul, in the same diversity context found for this formation elsewhere in Brazil (ibid). The latter indicates that forests in the area have significant ecological value, despite the fact that they do not lie within a forest dominated biome. The phytosociological survey identified 69 species, 55 genera and 34 families. Myrtaceae, Lauraceae and Euphorbiaceae were the families with the highest species richness. Furthermore, a vegetation survey near the grouped project area has indicated that also other typical taxa of the Araucaria Forest as well as the Atlantic lowland rainforest are found in the present-day semi-deciduous forest (such as Podocarpus, Ilex, Myrsine and Prunus for the former, and Alchornea, Moraceae, Arecaceae, and Myrtaceae for the later) (Behling et al., 2016). This suggests that the occurrence of such species in the area resulted from paleoclimatic changes that led to the creation of the Pampas. Therefore, their occurrence is natural and was not the result of introduction by the first European settlers of the region.

Threats to biodiversity: 'The original forest cover in Rio Grande do Sul is strongly reduced and fragmented and, particularly on Serra do Sudeste, little is known about the structure of its forests' (Jurnitz & Jarenkow, 2003). There has not been extensive research on the forests of the focus area and the available knowledge is thus limited. Lack of information comes as an additional threat to all anthropogenic pressures. For example, in the broader region, the common practice is to prevent the growth of woody vegetation in order to keep the areas open and suitable for ranching and agriculture. This is achieved by interrupting forest development at the early stages with grazing or by clearing out developed woody vegetation (that is not in the APP zone, usually with the use of fire to make more space for pasture areas). Such practices are exacerbating land degradation patterns. As Behling et al. (2016) suggest, 'at the present-day, the vegetation of the region is mostly determined either by frequent pasturing activities or the use of fire, which are detrimental to woody species, so that only small remnants of forest remain'. The national forest inventory for RS, identified frequent signs of anthropism occurring in 81% of the surveyed locations. The most prominent are grazing, logging and fire (Serviço Florestal Brasileiro, 2018). Furthermore, biodiversity, in both grassland and forest ecosystems of the region, is threatened by agricultural expansion and monocultures of soy and cereals. More recently, over the past few decades large scale silviculture of non-native species has expanded over the entire range of RS all the way to Argentina and Uruguay, mostly in the form of monoculture plantations. Certain policies that aimed to diversify the productive sectors of the state, had initially spurred the rampant conversion of lands for the

establishment of large-scale commercial plantations. However, due to the profound environmental impacts of the sector, the Environmental administration of the state designed the Zoning Plan for Silviculture (ZAS) and implemented it in 2010 (Gautreau & Velez, 2011). Overall, agricultural intensification brought an uncontrolled and accelerated expansion of the agricultural frontiers. The latter, in combination with 'demographic expansion and attendant consumption, outpaced the rate of renewal of the biotic resources, and it led, and is still leading, the environmental degradation. Soil, water and air are being contaminated by organic and inorganic pollutants and the soil productivity is being lost' (Roesch et al., 2009).

In sum, natural vegetation is primarily dominated by Pampas grasslands and includes, in smaller proportions, several types of arboreal vegetation types. Typical forest formations that have been identified in the region are: Dense and Mixed Ombrophilous Forest, Seasonal Deciduous and Semideciduous Forest, and areas of Pioneer Formations or Restinga.

In specific areas within the grouped project zone, ecological conditions are characterised by mosaic attributes between two ecosystem types: Pampas grasslands and its associated forest types. Such attributes are typical for ecotone areas.  which are critical for biodiversity maintenance since they support unique ecological dynamics. Therefore, they are particularly important for biodiversity and for ecological connectivity between patches of distinct ecosystem types. Regarding land use trends, rural lands in the region are being intensively managed for agriculture, silviculture and grazing. Current land use trends are seriously threatening natural ecosystems, both grasslands as well as those with woody vegetation. Isolated forest formations in rural properties still exist in areas protected by APP legislation, such as the vegetation growing next to waterways. Studies have suggested that afforestation might be the most successful strategy to stop the spread of degradation (Roesch et al., 2009). Using native tree species is highly preferred over the alternative of fast-growing trees cultivated for commercial purposes due to the various environmental externalities caused by the latter. Forestation with native tree species on the fragile soils of the region can halt degradation, reverse negative feedback loops and provide ecological benefits through improved landscape structure and functioning. The project aims to do so, being in line with a more suitable option for restoration reported in the available literature.

### 5.1.2 High Conservation Values (B1.2)

With regards to protected natural areas, the Pampa is the biome with the lowest representation in the National System of Conservation Units (SNUC), representing only 0.4% of the Brazilian continental area protected by conservation units (MMA, 2021). According to the State System of Conservation Units (SEUC) of Rio Grande do Sul (2022) there are 10 protected conservation units under public administration within the grouped project boundaries. Six of them lie entirely within the Pampa biome, while the remaining four expand over both the Pampa and Atlantic Forest biome (

Table 17: Conservation units within the grouped project zone).

*Table 17: Conservation units within the grouped project zone*

| Conservation unit | Area (ha) | Biome |
|---|---|---|
| Banhado Grande Environmental Protection Area | 136,935 | Atlantic forest & Pampas |
| Delta do Jacuí State Environmental Protection Area | 22,826.39 | Atlantic forest & Pampas |
| Itapuã State Park | 5,566.50 | Pampas |
| Delta do Jacui State Park | 14,242 | Atlantic forest & Pampas |
| Camaquã State Park | 7,992.50 | Atlantic forest & Pampas |
| Espinilho State Park | 1,617.14 | Pampas |
| Podocarpus State Park | 3,645 | Pampas |
| Banhado dos Pachecos Wildlife Refuge | 2,560 | Pampas |
| Ibirapuitã Biological Reserve | 351.42 | Pampas |
| São Donato Biological Reserve | 4,392 | Pampas |

Furthermore, significant ecological values have been identified within the grouped project boundaries. The “Priority Areas for Conservation, Sustainable Use and Benefit-Sharing of Brazilian Biodiversity” (Áreas Prioritárias para Conservação da Biodiversidade), updated in 2007, resulted in the identification of 105 areas of the Pampa biome, of which 41 (a total of 34,292 km2) were considered of extremely high biological importance (MMA, 2021). Priority areas are a public policy instrument that guides the development of research actions, biodiversity inventory, recovery of degraded areas and overexploited or endangered species, environmental licensing, inspection, identification of areas with potential for the creation of conservation units, ecological corridors, actions to promote sustainable use, environmental regularisation actions. These are geographically defined areas based on spatialized information on the occurrence of conservation targets, specialised information on anthropic activities, as well as spatialized information on activities that favour the conservation and sustainable use of biodiversity. It is important to note that the main purpose of the policy instrument is to indicate areas with significant biodiversity in order to guide and plan actions on large scales including planning plans, programs, projects and actions in biodiversity and its ecosystems. Subsequently, they lie outside already protected conservation units and

do not prevent any type of human intervention. Thus, it is up to the government and society to adopt appropriate actions for their conservation (MMA, 2019).

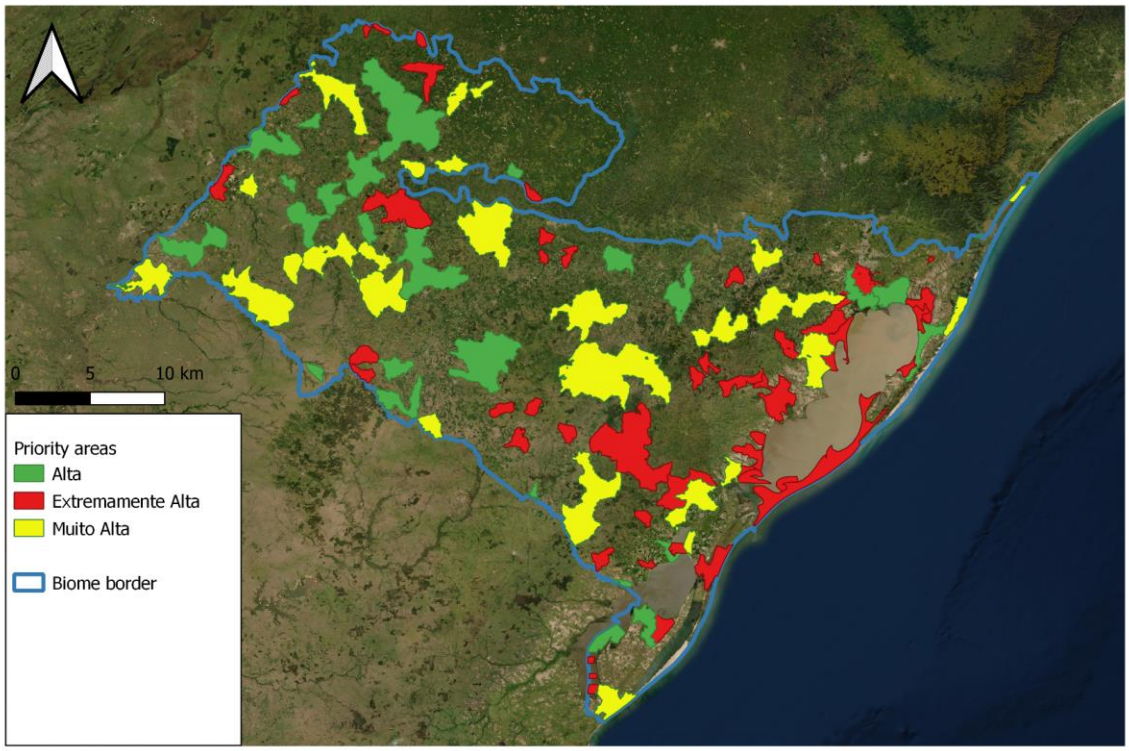


*Figure 20: Priority Areas for the Conservation of Biodiversity within the grouped project boundaries*

Moreover, in 2021 the government of the state initiated the Territorial Action Plan for the conservation of endangered species of Campanha Sul and Serra do Sudeste (Plano de Ação Territorial - PAT- nas regiões da Campanha Sul e Serra do Sudeste) (Estado do Rio Grande do Sul, 2021). The action plan aims to '*improve the conservation status of target species and their environments by valuing and promoting sustainable practices and social participation*' (ibid). Target species are those identified to be at endangered or critically endangered status and are naturally occuring in the area. Common pressures identified in the area are agriculture, silviculture, illegal extractivism, use of agrochemicals, fire and suppression of native vegetation. The whole PATzone falls within the defined grouped project boundaries (Figure 21). The action plan is part of the national wide Pro-Espécies programme (https://proespecies.eco.br) that aims to implement public policies and other initiatives that help to reduce threats and improve the conservation status of at least 290 Critically Endangered (CR) species that do not yet have conservation mechanisms and instruments.

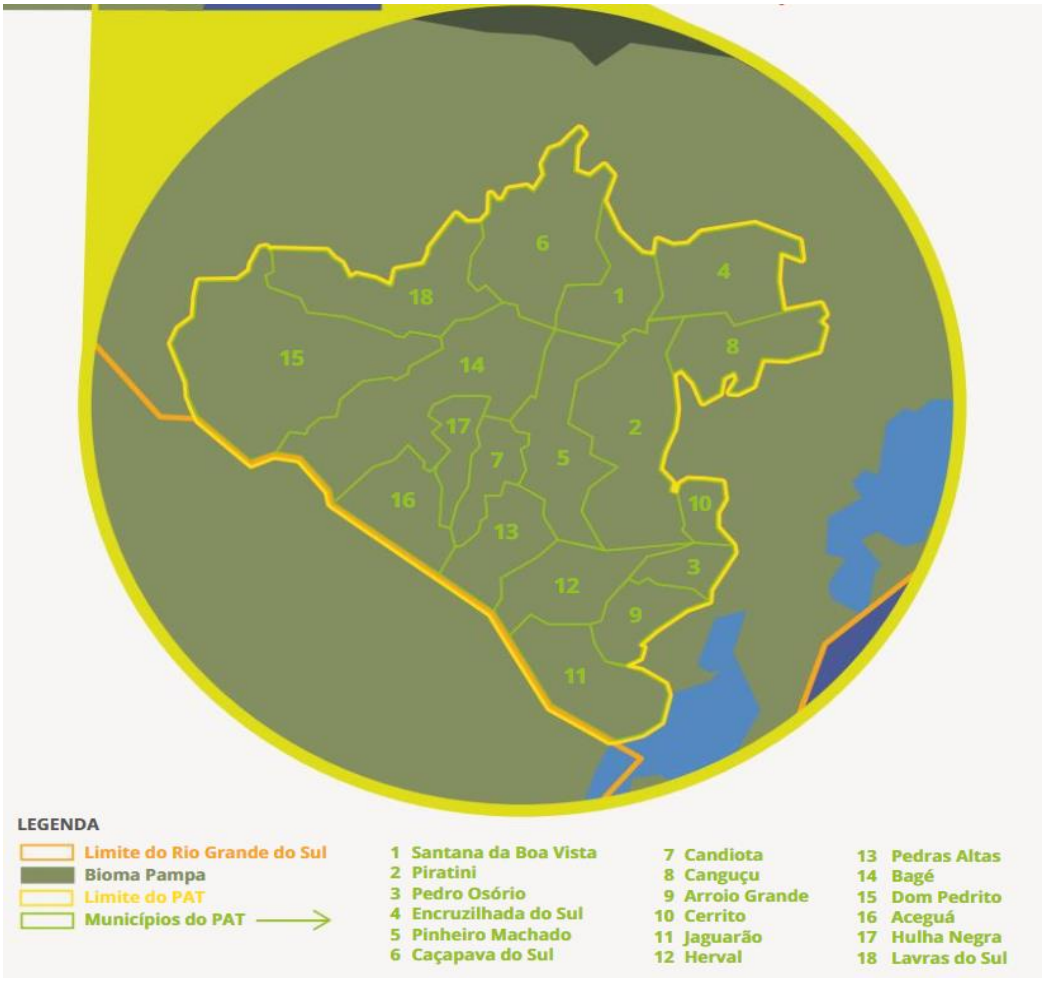


*Figure 21: Area of Territorial Action Plan Campanha Sul and Serra do Sudeste. Source: Executive summary of the Territorial Action Plan in the regions of Campanha Sul and Serra do Sudeste*

**High Biodiversity Conservation Priority (Exceptional Biodiversity Benefits, CCB Gold Level)**

According to the Langhammer's et al. (2007) guide for identifying Key Biodiversity Areas (KBAs), an area can be considered as such, if it can meet the vulnerability (or irreplaceability) criterion. 'A site meets the vulnerability criterion for KBAs if it holds globally significant numbers of one or more globally threatened species according to the IUCN Red List. These species, by definition, are threatened with extinction; thus, all areas where they occur in significant numbers must be considered global priorities for site-scale conservation' (Langhammer et al., 2007). In our project area, we actively promote the enhancement of *Araucaria angustifolia* populations, a species listed as Critically Endangered (CR) in the IUCN Red List. We are doing this by planting araucarias as one of the species used during the ARRproject. Because of this, in our project area there are parcels that (according to definition) should be considered KBAs, due to the occurrence of a CR species. Areas that are expected to harbour endangered species of trees have been identified as High Biodiversity Conservation Priority areas. It is worth mentioning that the sites of High Conservation Value areas are already present in the project zone and will be benefited from project implementation (see section above), while the High Biodiversity Conservation Priority Areas will only occur

in the 'with project' scenario. This is because araucaria trees are extremely rare and can hardly be found within the project boundaries. Thus, only the 'with project' scenario will trigger the attribute that can qualify the area as a KBA. This attribute would be 'populations of a Critically Endangered species'. Therefore, our project zone includes sites of high biodiversity conservation priority and will provide exceptional biodiversity benefits.

*Table 18: Biodiversity high conservation values*

| | |
|---|---|
| High Conservation Value | Concentration of biological diversity, including endemic species and rare, threatened or endangered species that are significant at global, regional or national levels. |
| Qualifying Attribute | A.angustifolia is an emblematic tree species of Atlantic forest and of the region. It is particularly valuable for its edible seeds and provides attractive visual elements in the landscape. Unfortunately, it is estimated that over the course of the past century, the populations of the species have declined by more than 97% (Thomas, 2013). The remaining populations are severely fragmented while mature individuals are still in decline. Particularly in Rio Grande do Sul where the project site is situated, IUCN reports that: 'the forest area (in the state), over half of which was made up of Araucaria, has plummeted from 40% land cover to 3% today.' |
| Focal Area | Planted areas in the project zone that include A.angustifolia individuals. |

### 5.1.3 Without-project Scenario: Biodiversity (B1.3)

As mentioned earlier (in section 5.1.1 Existing Conditions), the common practices in the region include the prevention of forest growth by clearing shrubs and other woody vegetation using fire and other means. Furthermore, conversion of natural ecosystems to agriculture, primarily crop cultivation and silviculture, has put the fragile forest grassland mosaic 'under siege' (Hermann et al., 2017).

In terms of landscape impacts, the 'without-project' scenario will significantly restrict the development and resilience of forest patches in the region.Areas where land conversion has occurred (either deforested or converted from natural non-forest formation) and are now used as pastures, will remain open and mostly stripped of natural woody vegetation due to the typical land use practices of overgrazing and burn/clear cycles. In addition, existing woody vegetation in open areas (e.g. forest formations, shrub thickets and isolated trees) inside private properties, that are not included in APP, is expected to be cleared at some point in the future. Thus, forest cover and native tree species richness will remain low in the area. In turn, the clearing of forest vegetation in the landscape has detrimental effects in soil erosion and fertility, water retention and quality as well as forest-related biodiversity (Kucera et al., 2020). For the area of the grouped project specifically it has been documented that *'after the natural vegetation is lost, soil organic matter becomes depleted, and the chemical, physical and biological properties of the soil become severely degraded, mainly due to the nutrient loss by leaching (cation exchange capacity from mineral particles is negligible) and the loss of soil cohesion (leading to low aggregate content of the soil)'* (Roesch et al., 2009).

Moreover, current practices put in danger even the existing forested areas protected as APP (and identified as HCVs for community) in the project zone. For example, it is quite common for grazing livestock to roam in these areas since most of the time there is no fencing. In addition, human induced fires for clearing trees and shrubs might burn forests within APP zones by accident, despite that these areas are usually not directly targeted during this practice. Therefore, there are certain pressures on remaining forest patches that without the project, will be exacerbated.

Forests can hold the soil in its place with their complex root structures and increase the amount of water that is being filtered and absorbed in the aquifer. As a result of current practices, ecosystem functions are impacted and ecological values are downgraded. This is particularly important in the project area since '*the soil in this region is extremely sandy in texture, it is considered as fragile as it is prone to water and wind erosion and also due to climate change and anthropogenic factors and this, in turn, can lead to the loss of biodiversity and socioeconomic opportunities*' (da Rocha et al., 2021). Moreover, cattle ranching in the area, '*even coexisting with the dominant forces of capitalism, maintains many "pre-modern" productive characteristics, as the domestic supply through the headwaters of the region. These headwaters are the only viable resource for the maintenance of daily basic necessities, both to the families of cattle raisers and for the water supply for the livestock*' (ibid). Along the same lines, Roesch et al. (2009) note that *'the geologic material makes the soils fragile and highly sensitive to water and wind erosion. The natural fragility of the soil, combined with the climatic conditions means that inappropriate human activities have led to intense soil degradation. This in turn has contributed to a socio-economic fragility as evidenced by the low Social Development Index of the region. The region has experienced losses of both biodiversity and socio-economic opportunities'*. Thus, sustainable land management practices and activities that are directly improving soil-water interactions, such as forestation with native trees, can potentially generate wider socioeconomic benefits apart from structural improvements in the landscape.

On the contrary, existing trends (if they continue unobstructed in the future), will exponentially degrade the land significantly and potentially reach critical thresholds. Negatively impacting processes (such as sandification), continue in *'a positive feed-back cycle, since there are no plants to counter the erosive effects of the wind and water'* (Roesch et al., 2009). Apart from forest biodiversity loss, reduction in productivity and increase of costs in agriculture, other additional costs should be expected such as, for filtering the water from sediments before distribution to final users. Furthermore, potential damages might occur from flash flooding of waterways and the increased volumes of runoff water in downstream communities.

Within the boundaries of the first project instance, there are currently 1119,8 hectares of open pasture land suitable for ARR. This is considered a grazing area and is intended to remain cleared and suitable for cattle ranching. In addition, most of the existing woody vegetation in the project zone will eventually be cleared.

Thus, in the without-project scenario and for the whole grouped project, the area of habitat degradation would be the sum of such areas in all project instances.

In sum, the expected impacts without the project are:

- Cover of native forest formations will remain limited (and diminishing) in the grouped project zone,

- The richness of native tree species will remain low,
- Endangered tree species will remain very scarce in the area,
- The availability of habitat for forest species will remain limited and forest patches will remain fragmented,
- Converted land will remain under intensive human use, perpetuating degradation, increasing erosion, deteriorating water quality and quantity in the aquifer,
- Threaten existing forested areas (APP) identified as HCV by prolonging the pressures of grazing and fire,
- Existing woody vegetation outside protected areas will eventually be cleared.

## 5.2 Net Positive Biodiversity Impacts

### 5.2.1 Expected Biodiversity Changes (B2.1)

In the region, native forest formations have diminished dramatically and land management practices have spurred historic degradation of soils and ecosystems. This is due to the fragmentation to which forest habitats are subjected (Jurnitz & Jarenkow, 2003). Increasing native forest cover in the Pampa biome can restore landscape structure and is expected to generate significant biodiversity benefits including improvement in the connectivity of highly fragmented forest remnants. In fact, it has been argued that revegetation using native species is the best way to restore degraded lands and soils in the region (Rovedder, 2008). ARR activities in areas where at some point, were deforested (or converted from natural non-forest formations), can be considered to be beneficial for biodiversity, especially when such activities involve tree species that are native to the region.

In the 'with-project' scenario, large parts of the project zone will be forested using a biodiverse mix of native tree species that can be found in natural forest patches of the region and the wider RS state.

Switching the land management model from cattle ranching to carbon financed afforestation and reforestation, will limit the pressure of grazing on forest remnants and eradicate the motivation for controlling vegetation using fire. As a result, natural regeneration will take place enabling the conditions for forest growth. Reestablishment of forest formations is critical for biodiversity maintenance because these forest remnants play an important role as ecological corridors, capable of providing gene flow between isolated populations, a factor considered critical for the conservation of many species. The development of native biodiverse forest patches in previously converted lands will also have beneficial effects on soil erosion control, water retention and quality as well as on forest-related species. In turn, this will improve the landscape structure and ecosystem functioning while it will also increase ecological values within the grouped project zone. In addition, the exclusion of grazers and the eradication of fire-clearing practices will also enhance the preservation of existing forest patches (protected as APPs and identified as community HCV areas).

Simultaneously, agricultural producers and communities surrounding the broader project zone will also receive benefits due to spillover effects. An added benefit from project activities is the creation of High Biodiversity Conservation Priority Areas due to the establishment of populations of the CR *Araucaria angustifolia*. In addition, it will make these stakeholders less prone to environmental related risks such as droughts, limited water availability and low water quality, flash floods and others. Eventually, biodiversity

resilience will also be enhanced with relation to the aforementioned risks that are particularly important, considering potential climate change effects.

For our ARR activities, we use seedlings of various native species. As a result, there are 3 measurable effects of the project in the area: 1. cover of native forest formations will increase; 2. the richness of native tree species will increase and 3. pressures from grazing and fire will be reduced. Moreover, several other co-benefits will be generated that are less straightforward to be measured in absolute terms. All expected project benefits are listed at the end of the section.

In total, within the boundaries of the first project instance, approximately 1119,8 hectares of pasture land will be afforested using a mix of native tree species. Thus, the habitat degradation avoided in the 'with-project' scenario, equals to the total area of the plots actively afforested.

Overall, biodiversity conditions in the project area are expected to worsen without any intervention. In the with-project scenario, conditions are expected to be better than those projected in the "without-project" scenario. Ultimately, project activities will enable the development of threatened native forest formations in the Pampa Biome in previously converted lands which will result in multiple benefits.

In sum, the expected impacts with the project are:

- Cover of native forest formations will increase in the grouped project zone,
- The richness of native tree species will increase,
- Populations of endangered tree species will be enhanced
- The availability of habitat for forest species and the connectivity of forest patches will increase,
- Large parts of the grouped project zone will be forested with native forest species. This will halt the degradation cycle and improve the provision of several ecosystem services such as biodiversity maintenance, erosion control, water quality regulation and water retention.
- Safeguard existing forested areas (APP) identified as HCV, by reducing the pressures of grazing and risk of fire,
- Existing sparse woody vegetation outside protected areas will be conserved.

*Table 19: Expected biodiversity changes*

| | |
|---|---|
| Biodiversity Element | Forest cover |
| Estimated Change | Positive (increase); actual |
| Justification of Change | By altering the revenue model of the properties from cattle ranching into carbon financed afforestation and reforestation, large extensive areas will be restored. ARR activities will prioritise areas that have been converted and are now used as pastures andare stripped of most woody vegetation. With the project, natural biodiverse forest is reestablished using native species from the region. Due to the elimination of grazing pressure and the reduction of fire risk, nature will be enabled to follow the course of ecological succession that in its climax stage, will evolve in a subtropical forest formation. The initial project activities will help in the critical early stages and act as a 'kick-start' stimulation of the process. The process will be safeguarded through the ongoing management of project sites over the project's lifetime. Increasing forest cover on previously converted land will have beneficial effects on the landscape and on important ecosystem services such as biodiversity maintenance, soil erosion control, soil maintenance, water retention and quality regulation. For tracking the development of forest growth in the project zone, we will use remote sensing and geospatial analysis of data (satellite imagery and field observations) that will be collected over the project's lifetime. This information will be processed and subsequently compared to the initial levels of forest cover in the project zone for measuring the impact. |

| | |
|---|---|
| Biodiversity Element | Tree species richness |
| Estimated Change | Positive (increase); actual |
| Justification of Change | With the implementation of the project, the area covered by forest vegetation within the project zone is expected to increase. For the ARR activities, we will use a biodiverse mix of native forest species avoiding in this way the negative effects of mono-culture forestation using exotics. As a result, restored areas will be covered with a biodiverse forest that will harbour a variety of tree species. Thus, the project is expected to have positive impacts on tree species richness. For tracking the increase rates in tree species richness, the number of tree species found in the project zone will be recorded. In order to verify related impacts, we will monitor the presence of different species in sampling plots established in areas that were actively forested during project activities. |

| | |
|---|---|
| Biodiversity Element | Populations of Critically Endangered (CR) and Endangered (EN) species |
| Estimated Change | Positive (increase); actual |
| Justification of Change | In our project, apart from regenerating converted areas with biodiverse native forest, we also aim to increase the presence and enhance the populations of critically endangered tree species. In that pursuit, we chose to include Araucaria angustifolia in the selection of species used for the ARR activities. A.angustifolia is an emblematic tree species of Atlantic forest and the wider region. It is particularly valuable for its edible seeds and provides attractive visual elements in the landscape. Unfortunately, it is estimated that over the course of the past century, the populations of the species have declined by more than 97% (Thomas, 2013). The remaining populations are severely fragmented while mature individuals are still in decline. Particularly in Rio Grande do Sul where the project site is situated, IUCN reports that: 'the forest area (in the state), over half of which was made up of Araucaria, has plummeted from 40% land cover to 3% today.' Thus, the project will benefit the populations of a very special, rare and threatened species in a region that is in urgent need for preserving the species. Over the project's lifetime, progress towards this goal will be tracked by monitoring the survival of araucaria seedlings. After the first 1 year, survival will be replaced with Recruitment rates of the seedlings. |

| | |
|---|---|
| Biodiversity Element | Habitat connectivity for forest related species |
| Estimated Change | Positive (increase); expected |
| Justification of Change | By using a biodiverse mix of native tree species, the project aims to restore patches of subtropical forest in the project region. Due to the prevalent deterioration of forest ecosystems that is prevalent in the broader area, forest related species of fauna and flora have suffered from habitat loss and degradation. The project is expected to have positive effects by increasing the extent and connectivity of suitable habitat for species related with forest ecosystems. Considering the increased pressures that forests have been subject to in the past several decades, positive effects from project activities can be seen as particularly valuable for the conservation of associated biodiversity. However, biodiversity does not respond in a predicted fashion to land interventions. Thus, it is hard to estimate what biodiversity responses will take place, or when biodiversity will respond to the project activities. Prior to the project, implementation areas have very scarce tree cover and forest is grown almost from 'scratch'. Therefore, some time lag should be expected until signs of biodiversity responses can be observed and monitored. Due to |

| | |
|---|---|
| | these inherent ecological complexities, we will not include this biodiversity element in our monitoring plan. Nonetheless, for internal and communication reasons, we plan to install camera traps at a later stage to record wildlife sightings in the afforested plots. In the meantime, forest cover can be used as a proxy indicator for improvements in forested habitats. |

### 5.2.2 Mitigation Measures (B2.3)

Following the precautionary principle, several measures are implemented (or planned) in order to mitigate potential adverse effects on biodiversity and HCVs during and after project implementation. For example, the project origination process entails criteria that aim to avoid the conversion of natural, non-forest formations that are prevalent in the Pampa biome. In addition, measures relate both to resources and methods used for tree planting as well as to post implementation management approaches. Our mitigation approaches aim to limit the risks for negative effects on existing biodiversity and soil conditions, maintenance and safeguard of existing HCVs. Mitigation measures taken during the project are listed below:

- Project origination:
  - Prioritise areas that have been deforested in the last generation (10-35 years) for the implementation of ARR activities.
  - Alternatively, implement ARR activities in areas that have already been converted from their natural vegetation cover.
- Planting resources and methods:
  - For fertilisation, we will only use organic fertiliser (C20%).
  - The selection of species we made for the ARR activities includes different and only native species.
  - Our planting activities are carried out with minimum tillage in order to have the lowest soil disturbance degree possible. We employ 2 different planting approaches depending on soil characteristics. In both techniques, soil disturbance is less than 10%.
  - Having minimum disturbance on existing biodiversity is a top priority during. This means that sometimes, we need to make decisions that complicate implementation logistics, making it more time consuming or costly. For instance, in cases where a planting plot is suitable for mechanical planting, but it is inaccessible by machinery due to the surrounding vegetation, vegetation is not cleared for opening up a road. Instead, manual planting is performed, which requires more cost, effort, and man hours.

- Post implementation management:
    - Grazing needs to be controlled inside implementation areas in the initial stages of forest development. Several signs (dung, trampled soil and vegetation, footprints etc.) of grazing inside such areas have been observed. To mitigate that, we will install new fences and repair existing ones around the property. The specific measure, apart from reinforcing chances for successful ARR activities, it also reduces grazing pressure on existing forest areas (APPs) inside the property. If fences are down, roaming cattle (and other grazers) will forage inside forests.
    - Another serious pressure is the practice of using fire to clear the land in order to improve grazing conditions. This practice poses a threat to protected forest patches (HCVs identified in the area), as fire could accidentally expand in these areas, as well as in implementation areas. With the project, the direct motivation to clear the land will become obsolete. However, fire used in neighbouring farms is still posing threat to the climate and biodiversity objectives of the project. Thus, mitigation measures against fires are deemed necessary. To mitigate this risk, we will design and implement a fire management and response plan for the whole project zone.
    - One of the post-implementation activities includes the installation of 160 bee hives for wild bees. The management will be handled by an experienced local beekeeper involving in this way local expertise and entrepreneurship in project activities while improving pollination services simultaneously.

### 5.2.3 Net Positive Biodiversity Impacts (B2.2, GL1.4)

In the project scenario the anticipated net impacts on biodiversity within the grouped project zone will be positive, compared to a without project land use scenario. Switching the revenue model of private properties, will involve fundamental changes in land use and management practices. As a result, landscape structure will be improved significantly. During these transformations, forest cover will develop on pastures that have previously been converted from their natural vegetation cover (either forest or non-forest formations). In total, in the first project instance, 1119,8 hectares of pasture will be converted into biodiverse native forest. Several benefits will accrue from such changes. Examples include increasing forest cover, tree species richness and habitat for forest species, enhancing populations of CR species (and creating new high priority conservation areas), improved erosion control, soil health, water retention and quality services. Furthermore, the Serra do Sudeste Grouped Project aims to contribute to grassland ecosystem conservation by engaging in research projects with local universities that focus on researching biodiversity of the Pampas. In relation to grassland conservation, the project will also implement activities related to sustainable pasture management and grazing practices. These actions are expected to contribute to the generation of net positive biodiversity impacts. A more detailed description of how the project will generate net benefits on biodiversity can be found in

Table 20 below.

*Table 20: Net positive biodiversity impacts*

| Element | With project | Without project | Gold Level |
|---|---|---|---|
| Forest cover | A total of 1119,8 hectares will be converted into biodiverse native forest in the first project instance. | Grazing areas will remain open with restricted and fragmented forest patches. | Changes in forest ecosystems due to climate change detected. |
| Tree species richness | 29 native tree species will be planted inside implementation areas during ARR activities. | Implementation areas are managed to remain open. Very few native tree species are present inside implementation areas. | Responses of different native tree species to climate change are monitored. |
| Threatened tree species | Threatened tree species will be established inside implementation areas. | No threatened tree species are present inside implementation areas. | Effects of climate change on CR tree species are monitored. |
| Forest species habitat | Habitat for forest associated species will be increased. In total, 1119,8 hectares of forest will be created in the first project instance alone. | Suitable habitat for forest species is highly fragmented and restricted to only areas along waterways within the property. | Changes in forest habitat suitability due to climate change are detected. |
| Conservation of grassland ecosystems | Partnerships with local research institutions are formed focusing on researching biodiversity of the Pampas. Projects on sustainable pasture management and grazing practices are initiated. | Research on the biodiversity of the Pampas remains isolated and scarce. Pasture lands are poorly managed perpetuating degradation cycles. Such issues remain in an academic silo without the participation of private companies. | Effects of climate change on Pampas biodiversity and pasture productivity are researched. |

| | | | |
|---|---|---|---|
| Erosion levels | Increased forest cover on previously converted lands reduces the amount of soil lost due to erosion. Complex root formations maintain a stable soil structure. | Converted lands remain without native forest cover. The landscape has limited ability to hold soil in its place because forest patches remain small and fragmented. | Nutrient loss and soil structure degradation is reduced. Impacts of climate change on soil productivity are mitigated. |
| Water related ecosystem services | Forests provide valuable services related to water such as retention and quality maintenance. Increased forest cover in the project zone will enhance the capacity of the landscape to retain water and the water quality will be improved through filtration and (soil) sediment retention. | Forests in the landscape remain small and fragmented. Their ability to absorb rainfall water and to filter water permeating in the aquifer is limited. Sediments will continuously be washed away and enter the waterways. The process leads to further land degradation. | Quantity of water in the aquifer<br>is increased and its quality improved. Landscape resilience with regards to altered rainfall regimes due to climate change is improved. |
| Pressure from grazing | Grazing livestock is removed from the project zone. Fences are installed and maintained around the property to keep out roaming grazers from neighbouring farms. Pressure from grazing on forest patches is drastically reduced. | Fences are not maintained allowing grazers to roam into protected APPs, putting an additional pressure on already threatened forest remnants. Overgrazing pressures and their negative effects are perpetuated. | Effects of frequent browsing of domesticated animals on trees and shrubs is reduced. Grazing intensity is monitored and pressure mitigation measures (e.g. fencing, talking with neighbouring farm owners) are implemented. |
| Fire risk | Revenue model of the farm is changed. As a result, there is no more a direct motivation to use fire as a way to manage the land. Natural | Fire is still used as a means to clear land from woody vegetation and increase pasture productivity, contributing to emissions. No fire management plan is | Exacerbated effects of fire (e.g. more intense outbreaks due to more dry biomass on the ground) are mitigated through |

| | | | |
|---|---|---|---|
| | succession takes place and forest cover is enabled. A fire response plan is designed and implemented in the project area. Existing forest areas under APP are safeguarded from potential spread of fire from nearby properties. The pressure from using fire (and associated risks) is drastically reduced. | implemented. Risk of fire spreading in existing forest areas under APP remains. The pressure of fire use (and associated risk) is perpetuated. | management and monitoring. Fire regimes are monitored and extreme impacts are prevented. |

### 5.2.4 High Conservation Values Protected (B2.4)

The HCV attributes are not expected to be negatively affected by the project. At the moment, 96.6 hectares of the project zone have been identified as HCV area. These are the forested areas along water streams currently designated as APP and protected by national legislation. By reducing the pressures of grazing and fire in the project area, the project will preserve HCV areas that are currently in deterioration risk, despite being protected by law. Furthermore, monitoring pressures and response measures are also focusing on HCV areas which will be benefited from project activities (more information in section 5.4.1 Biodiversity Monitoring Plan). No disturbance will occur inside HCV, no tillage will take place, no clearing of existing vegetation and no resources will be extracted from them (such as native seedlings, seeds or water).

In addition, with the project new HCV will be created because it will favour the recovery of ecological niches for critically endangered species. The project will enable the conditions for the creation of 2.25 hectares of High Priority Conservation Areas within the project zone. This refers to the areas actively planted using such species, namely *Araucaria angustifolia*.

### 5.2.5 Species Used (B2.5)

In total, 29 native species are recommended to use for ARR activities of the project (Table 21). These are all the species that are suitable and can potentially be used for planting in the broader region of the grouped project. For each project instance, a selection of the appropriate species will be made, in order to increase adaptability and maximise forest growth potential. Apart from site conditions, availability of plantable seedlings among the different species from the partnering nurseries will also determine selection for each specific planting round. The current selection might be adapted further (add or remove species) as we further refine the planting approach for the grouped project. Any changes will be reported in subsequent verification events.

For determining the placement of species within each project instance zone, we take into account the soil profile and edaphological conditions. Species are selected to be planted in areas where the conditions are right so that they have a good chance to thrive. An assessment of soil and vegetation conditions is carried out prior to project implementation that is used to inform species selection and distribution in each site of the grouped project. The following factors are being considered:

a. Soil texture
    i. sandy
    ii. loam
    iii. clay
b. Soil fertility
    i. low
    ii. high
c. Drainage
    i. well drained
    ii. slightly swampy
    iii. seasonally swampy
    iv. permanently swampy
d. Soil depth
    i. shallow close to rock bed
    ii. gravelly soil
    iii. deep soil
e. Native forest proximity
    i. near
    ii. far

*Table 21: Species used for ARR activities*

| Scientific name | Common name |
|---|---|
| Parapiptadenia rigida | Angico |
| Psidium cattleyanum | Araçá |
| Araucaria angustifolia | Araucaria |
| Lithraea molleoides | Aroeira Brava |
| Schinus molle | Aroeira Salsa |
| Schinus therebintifolius | Aroeira Vermelha |
| Sebastiania commersoniana | Branquilho |
| Peltophorum dubium | Canafistula |
| Nectandra lanceolata | Canela amarela |
| Cedrela fissilis | Cedro |

| | |
|---|---|
| Eugenia involucrata | Cereja |
| Allophylus edulis | Chal Chal |
| Erythrina cristagalli | Corticeira do banhado |
| Acca Sellowiana | Goiaba Serrana |
| Campomanesia xanthocarpa | Guabiroba |
| Myrcianthes pungens | Guabiju |
| Cordia americana | Guajuvira |
| Inga vera | Inga |
| Inga marginata | Inga Feijão |
| Inga sessilis | Inga Macaco |
| Handroanthus albus | Ipe Amarelo |
| Handroanthus heptaphyllus | Ipe Roxo |
| Cordia trichotoma | Louro Madeira |
| Bauhinia forficata | Pata de Vaca |
| Eugenia uniflora | Pitangueira |
| Quillaja brasiliensis | Sabão de soldado |
| Vitex megapotamica | Tarumã |
| Tipuana tipu | Tipuana |

### 5.2.6 Invasive Species (B2.5)

As it can be verified by assessing the list of species provided in section 5.2.5, none of the species used have been identified as invasive according to the invasive species inventory compiled by the Secretary of Environment and Sustainable Development of RS (Instituto Hórus, 2016).

### 5.2.7 Impacts of Non-native Species (B2.6)

All species used in the project are native. Section not applicable.

### 5.2.8 GMO Exclusion (B2.7)

As it can be verified by assessing the list of species provided in section 5.2.5, none of the species used have been genetically modified. Section not applicable.

### 5.2.9 Inputs Justification (B2.8)

*Table 22: Inputs justification*

| | |
|---|---|
| Name | Organic (C 20%) Fertiliser Pellets with Phosphorus (NPK 2-10-2). |
| Justification of Use | Supply nutrients required for plant nourishment which are vital for tree health in the initial stages of growth. Boost plant growth and improve soil fertility. Input intensity is determined as follows:<br>- 125kg/ha in areas with lower planting density.<br>- 166kg/ha in areas with higher planting density. |
| Potential Adverse Effect | No adverse effects on the region's environment and/or communities are foreseen. Fertiliser from organic sources is used instead of chemical. Organic fertiliser is rich in organic matter, which helps soil microfauna thrive. Furthermore, the fertiliser will be applied inside the planting hole and ensures that nutrients stay in the soil and are not carried off site through run off water. |

| | |
|---|---|
| Name | Granulated baits for ant control. |
| Justification of Use | Prevents infestation of implementation areas with leaf-cutting ants that can harm growing seedlings. Heavy ant infestation can damage the seedling beyond recovery and significantly impair seedling survival. In order to retain input intensity at the lowest possible limit, the use of the chemical will not be the same across the project zone. Instead implementation areas will be surveyed, in order to determine the levels of ant activity. Once the presence of ants in different implementation plots has been assessed, baits will be placed close to the nests and also in strategic places in a preventive way. Input intensity is estimated at an average of 0.200 grams per hectare. |
| Potential Adverse Effect | The product has shown limited toxicity in different organisms such as algae, microcrustaceans and fish. Corresponding toxicity levels are CE50(96 h): >1000 mg/l (Chlorella vulgaris) CE50 (48 h):231,68 mg/l |

| | |
|---|---|
| | (Daphinia similis) CL50(96 h): 604,63 mg/l (Brachydanio rerio). According to acute toxicity level classifications, toxicity of the product on the above-mentioned organisms is classified as Relatively harmless (algae) and Practically non toxic (microcrustaceans and fish) (Juneidi, 2015). It has a persistence and degradability rate of 37.59% in 28 days while soil mobility is CL50 - 14 days > 4777.78 mg/kg of silica (Eisenia fetida). All instructions from the manufacturer regarding health and safety, application, use, storage and disposal will be strictly followed under the supervision of the team leaders. The personnel responsible for using the input are adequately trained and have the necessary experience to handle such materials. To avoid leakage of the product and contamination of the surrounding environment with the active ingredients, baits will not be applied on rainy days or in areas with very wet soil, nor during the hottest part of the day. Furthermore, no baits will be applied close to waterways since the active compounds of the product have high degree of bioaccumulation in aquatic organisms. Due to the relatively low toxicity levels in combination with proper application and handling practices, potential adverse effects from using the product are not foreseen. |

| | |
|---|---|
| Name | Limestone pH stabiliser |
| Justification of Use | Historically, soil acidity is one of the main factors responsible for the low productivity of soils in Brazil. Soils in the country usually have low levels of calcium and magnesium. The application of limestone compounds to the soil has been widely accepted as a possible solution to deal with poor soil conditions and with excellent results. Limestone application aims at improving pH levels and availability of nutrients for cultivation. It also improves the root environment of plants and stimulates greater root growth, allowing for greater efficiency of water and nutrient absorption. The input will be applied in the planting hole together with the fertilisation. Input intensity is determined as follows:<br><br>62.5kg/ha in areas with lower planting density.<br><br>83.3kg/ha in areas with higher planting density. |
| Potential Adverse Effect | No potential adverse effects are predicted from using the input during project activities. |

### 5.2.10 Waste Products (B2.9)

Ensuring that no waste pollution is resulting from project activities is considered a high priority. Different types of waste are generated during project implementation. Waste from project activities is classified as following:

- Organic
- Plastic and other solid waste
- Chemical waste

Waste from each category is identified and treated separately following existing guidelines. Organic waste includes any biodegradable matter that can be broken down into simple organic molecules by living organisms (by e.g. compost, digestion, decomposition). This mainly includes food residues, plant materials such as damaged seedlings and others. Such waste is disposed inside a pit, created at the project site. To avoid the release of GHG resulting from the breakdown of nutrients contained in the waste, the pit is buried after the end of implementation activities. The waste is then decomposed mostly through anaerobic processes (because the pit is closed) and the broken down nutrients are assimilated in the soil or absorbed by vegetation.

All plastic and other solid waste is collected at a specified location inside the project zone. Every week, the accumulated waste is loaded on a truck and transported to the nearby city of Bage, where it is disposed of in the municipal waste management system at specified disposal points.

## 5.3 Offsite Biodiversity Impacts

### 5.3.1 Negative Offsite Biodiversity Impacts (B3.1) and Mitigation Measures (B3.2)

No negative offsite biodiversity impacts are foreseen resulting from the implementation of project activities.

Firstly, landowners lease the land per season to cattle ranchers. By communicating the potential of the project and by creating a shared vision with the owners for the property, we shifted their views about the possible economic uses of the land. What happens is that they willingly decide to not renew the lease for cattle ranching, but to opt for an ARR model instead. Thus, in practice, the project proponent leases the land without any cattle prior to the initiation of ARR activities. In Brazil, it is not allowed for a landowner to clear forest in order to engage in agricultural activities so there are two scenarios for the cattle that were at the site prior to the project. They are either sent to the slaughterhouse, or moved on to lands that are already used for ranching. Because the owners are usually not active in the cattle business and do not own cattle themselves, and due to the fact that deforestation for agricultural activities is prohibited, no negative offsite biodiversity impacts are expected from added grazing pressure induced by displaced cattle.

Secondly, in the area, there are no communities that rely on natural resource extraction for subsistence purposes. Thus, no leakage of extractive activities is expected as a result of project implementation that could result in negative offsite impacts on biodiversity.

Thirdly, in terms of environmental footprint, we do not remove seeds, seedlings, topsoil, or other natural resources from the surrounding area for the ARR activities in the implementation sites. We buy our

materials from local suppliers and conservation nurseries, which adds to the overall social benefits of the project.

Furthermore, no offsite impacts are expected on air, soil, or water resources from pollution, since we do not apply any chemical fertilizers. Instead, we only use organic fertilisers and limestone to enhance soil fertility in the planting areas and fertiliser is applied directly inside the planting hole and not on topsoil. Thus, the risk of transportation of the nutrients to offsite areas through runoff water is mitigated.

Finally, we carry out ARR activities during rainy seasons when weather conditions are suitable for planting. During the planting season, there is overall a lot of sunlight with enough precipitation to provide water for the young seedlings. A benefit of planting during this period is the pressure reduction on local natural water resources such as lakes, rivers and aquifers since seedlings are irrigated only if needed. As a result, we do not extract water resources for the ARR activities. Therefore, no offsite negative impacts are foreseen in the surrounding area due to reduced water availability in the sub-catchment.

### 5.3.2 Net Offsite Biodiversity Benefits (B3.3)

As demonstrated in 5.3.1, no significant offsite biodiversity impacts are expected from project activities. There is limited potential for offsite impacts due to leaked agricultural practices and extractive uses. Considering our planting design and approach, the net offsite impact of the project on biodiversity is expected to be positive. The project's potential biodiversity benefits within the project zone is demonstrated in the section 5.2.3 Net Biodiversity Impacts. Overall, the project is expected to have positive impacts on forest cover and habitat, native tree (including threatened) species, soil and water conditions as well as pressure and risk reduction from grazing and fire. Negative impacts of forestation activities on natural, non-forest ecosystems during grouped project scale up is avoided by prioritising deforested or already converted lands.

In reality, the project is anticipated to actually have positive offsite environmental benefits. For example, increased forest cover will provide habitat for forest related species from outside the project zone and improve connectivity of (currently highly fragmented) forest patches in the vegetation mosaic of the Pampa biome. Apart from biodiversity, conversion of converted lands into native biodiverse forests is expected to have offsite benefits in the provision of important ecosystem services. For example, if forest cover is increased, then a reduction in erosion rates and the amount of nutrients and soil loss due to runoff water should be expected. Moreover, increasing native forest cover will enhance water flow regulation capacity of the landscape by improving the retention of water in the soil. Forest vegetation will also serve as a filtration layer that will purify water while it permeates through the soil layers and enters the aquifer. As a result, the quantity and quality of water in the catchment will increase. The increase will be beneficial not only for end users and agriculture, but will also improve the ecological conditions of both forest and grassland habitats in the Pampa Bime. Furthermore, the installation of beehives in the project area (for local honey production), are expected to enhance the supply of pollination services of the surrounding landscape.

By definition, all of the above-mentioned benefits will 'spillover' beyond project boundaries providing thus offsite biodiversity benefits.

## 5.4 Biodiversity Impact Monitoring

### 5.4.1 Biodiversity Monitoring Plan (B4.1, B4.2, GL1.4, GL3.4)

A monitoring plan should aim not merely to surveil different attributes of biodiversity, but instead to track progress towards explicit, clearly defined and unambiguous objectives. If monitoring is designed and executed properly, it becomes possible to evaluate management measures and interventions. In turn, depending on the insights gained through monitoring, it can be assessed whether adaptation is necessary in order to achieve the objectives. As Caryl et al. (1998) explain, *'monitoring is characterized primarily by objectives and by being part of an adaptive management cycle. Monitoring uses change data to evaluate management and make decisions.* Or as Tucker et al. (2005) put it, '*biodiversity monitoring programme is the whole series of related surveys and analysis that aims to establish whether or not all the specific biodiversity objectives for the area are being achieved*.'

The monitoring plan described in this section, aims to track whether the project objectives set that relate to biodiversity are being met. In addition, through monitoring we will be able to identify ineffective management measures and enable adaptation that will avert the project from failing to meet its biodiversity objectives. The biodiversity objectives of the project have been described previously (in 2.1: Project Goals, Design and Long-Term Viability) but only briefly. However, when defining objectives for a biodiversity monitoring plan, there are certain components that need to be included for the objectives to be relevant in practical terms. Caryl et al (1998) define the following six components required for setting a complete management objective: (1) Species or Habitat Indicator: identifies what will be monitored; (2) Location: geographical area; (3) Attribute: aspect of the species or indicator (e.g., size, density, cover); (4) Action: the verb of your objective (e.g., increase, decrease, maintain); (5) Quantity/Status: measurable state or degree of change for the attribute; (6) Time frame: the time needed for management to prove itself effective. Failing to include any of the above components would make it infeasible to monitor the objective in a meaningful manner. Considering the vision developed for the project site, 3 objectives related to the **state** of biodiversity have been defined. Biodiversity features of these objectives are: forest cover, native tree species richness and populations of endangered tree species. The objectives for these features in the first project instance are defined below:

I. Forest cover: Increase Forest cover by 35% (compared to current condition) in 30 years inside the project area
II. Native tree species richness: Increase native tree species richness inside implementation areas (compared to current conditions) so that at least 25 different species are recorded by the end of the project's lifetime.
III. Populations of endangered tree species: Ensure that seedling survival of A. angustifolia individuals is maintained above 80% (meeting this objective will result in the creation of High Biodiversity Conservation Priority areas that do not exist in the 'without project scenario' - see section 5.1.2).

The above listed biodiversity objectives and their monitoring, will enable us to track progress towards the desired biodiversity state of the project area. However, objectives and indicators that relate only to the state of biodiversity are not sufficient to efficiently monitor success of a project. As Tucker et al. (2005) argue, *'objectives should be set for the biodiversity features themselves (i.e. their state), the factors*

*that influence them (i.e. pressures) and for the management activities that may influence these pressures (i.e. the responses)'.*

Following the guidelines of conservation science (which are also suggested in the latest CCB guide v.3.1), we chose to monitor two Pressure and two Response indicators to complement our selected state indicators.

'The Pressure component is an assessment of what factors may potentially impact on the biodiversity feature that influences its state' (Tucker et al, 2005). As described previously in this project document, the 2 main pressures for the development of forest are grazing and fires of anthropogenic origin. Domesticated grazers from nearby farms usually roam inside project boundaries. This can be particularly threatening to the biodiversity objectives of the project because the animals will graze on the young seedlings impairing their development. Large grazers will also trample soils and growing vegetation. In practice, grazing obstructs the growth of forest. Moreover, clearing land with fire is a standard agricultural practice in the region and our project area. There is a considerable threat for forest patches from this practice since fire could potentially expand inside project boundaries and destroy forest vegetation. Losing vegetation due to fire could be devastating to the project's biodiversity (and climate) objectives, as it is likely that in such an event, significant amounts of biomass and habitat (including associated benefits and species) will be lost. Considering the intensity and threat imposed by these pressures, we deemed that it is necessary to set clear objectives and monitor progress towards them throughout the project's lifetime.

Identification and definition of threat (pressure) objectives was carried out following the principles described in the Threat Reduction Assessment (TRA) guide for Conservation (Margoluis & Salafsky, 2001). One of the most important arguments for applying TRA, is that '*by measuring **threats**, you get an indirect measurement of conservation **success**. Changes in all threats can be measured or estimated. You can systematically, either quantitatively or qualitatively, assess the degree of reduction of all threats at any given time*.' There are some important advantages of using TRA for tracking progress towards objectives compared to biological indicators. For example, TRA can measure changes over short time periods which is critical considering the relation of the threats to time (e.g. a flock of cattle can breach project boundaries anytime, a fire outbreak can happen in just a few moments). Delaying to detect changes could be seriously impactful. TRA approach also reflects changes that occur throughout the project site (compared to biological indicators that can only reflect changes inside sampling plots) and that is more suited for tracking pressures occurring in the whole project zone. The guide suggests that projects need to identify threats and define what 100% reduction means. The definition of this reduction was set as the project's objectives for each of these **pressures**:

I. Grazing: No grazers will enter and roam inside implementation and HCV areas during the project lifetime.
II. Fire: No more than 5% of total forest cover will be lost due to fire in one year.

'The Response component is an assessment of the policies, laws, practices, etc. that have been created to manage and conserve the biodiversity feature and alleviate or regulate the pressures on it' (Tucker et al., 2005). In order to mitigate the risk from imposed threats, we will implement a response management objective for each of the pressures identified (above) in our project area. **Response** management objectives are defined to be the following:

I. Fencing: Ensure that fences around the project area boundaries are installed within one year after project implementation and are maintained in good condition throughout the project's lifetime.
II. Fire management plan: Design and implement a fire response and management plan for the whole project zone. Ensure that the plan is operational at any time for the total duration of the project.

All of the biodiversity state, pressure, response objectives of the project (7 in total) have been identified and defined. In the following part of this section, the methodologies employed for tracking progress (including types of measurements, sampling methods, relevant areas, frequency of monitoring and reporting) are described for each biodiversity objective.

**Forest cover:** Increase of forest cover inside the project area will be monitored using a combination of methods. First, we will measure how the forest is growing by digitally analysing remote sensing data, such as satellite and drone imagery. The first high resolution image used for site stratification will be used as the baseline. A new satellite image of the project zone will be acquired and analysed every auditing period (5 years). Comparing each new image with the previous one, will provide an efficient, accurate, measurable and objective way to track changes in forest cover. However, the development of a forest is usually a very slow process. To compensate for the inherent difficulties of measuring forest growth related with time horizon, we complement our monitoring methodology with ground truthing measurements during the first years after implementation. For these measurements, we will use the established (random) permanent plots (10m x 10m) used for the monitoring of biomass growth. In this second process, we will use the data coming in from the biomass monitoring (regarding growth) to reference the satellite image interpretation values. Once the correlation of ground data with the imagery is established, then it will be possible to extrapolate the findings to the whole implementation area. Referencing ground data with the satellite imagery can significantly enhance the functionality and reliability of remote sensing monitoring for our purpose. The combination of methods will enable for a robust and accurate monitoring of forest growth in the project zone.

**Native tree species richness:** Species richness (S) is the number of species within a defined area. This attribute will be used for monitoring project effects on native tree species presence inside implementation areas. In order to increase the efficiency of the monitoring plan, for measuring and recording tree species richness we opt for using the (random) biomass monitoring plots (10m x 10m) that will be established. Inside the plots, the number of different tree species will be measured and recorded using standard digital sampling forms. The final richness from each measurement is considered to be the sum of unique species recorded across all sample plots. Thus, the methodological approach chosen for sampling tree species richness is permanent random plots. Despite the fact that the project applied a planting method of planting in rows, it is still chosen to use plots for this indicator in order to capture the effects of natural regeneration over time. We expect more tree species to establish in the area over time and thus, plots are more suited for the long-term monitoring of species richness. All of the collected data will be imported in a project dedicated data repository for documentation, further analysis as well as for the verification process. Due to our prior knowledge of the implementation (planting) process, it will be possible to make a confident extrapolation of the sampling data for the whole implementation area. In addition, having permanent plots

for monitoring this attribute, will allow us to track the evolution of tree species richness over time. Sampling and assessment for tree species richness will occur every verification period (5 years).

**Populations of threatened tree species:** Seedlings of the critically endangered *A. angustifolia* will be planted in the best available soils in terms of fertility, depth and moisture. However, the viability of a population depends on other attributes that can provide information on certain dynamics. Thus, it is essential that the progress of threatened tree seedlings is being monitored, in order to be able to track progress towards this specific objective. Such measurements are particularly important for rare species which are confined to only a few sites or populations (Hill et al., 2005). Monitoring survival rates is highly relevant in this case because the first years after planting are critical for the long-term establishment of a population. Total survival rate is the percentage of living tree seedlings against the total tree seedlings planted. In this pursuit, the methodology suggested in the Seedling Survival Count Guideline (RA, 2020) is employed. In the guide, sampling design specific to areas planted in row alignment is elaborated. This is suited for our survival monitoring since trees are planted in rows. Using the guidance of this manual, sampling is designed using planting rows as the basis. Measurements are taken at every 5th planting row inside an implementation plot, all the way until the end of that row. Whether the tree is alive, dead or missing is recorded along the entire rows. Seedling condition is recorded in all cases as healthy, damaged or dead, following the recommendations of the Lebanon Reforestation Initiative Protocol (2014).

A seedling is considered:

- Healthy: whenever it has a green top bud and is more than 50% green.
- Damaged: when the top is still green but more than 50% of its leaves are brown or dead. Seedlings that are broken, grazed on or slightly burnt but still show signs of survival, are also considered damaged.

Apart from survival rates, signs of pressures and stress are also recorded in order to collect information that can effectively inform management interventions. Only araucaria seedlings will be assessed for the biodiversity monitoring purposes (seedling survival for all seedlings is measured separately and it is not related to any verification process). Sampling will be undertaken monthly for the first 3 months as this is the appropriate frequency in the critical first stages of tree development. Sampling will be undertaken once a year for the next 3 years. After 3 years, survival rates will be substituted with a different, better suited measurement such as diameter at breast height (DBH) or recruitment rate (the process by which individuals are added to the mature population). All data will be collected and stored in a standard manner for documentation and further analysis as well as for verification purposes.

**Grazing:** Monitoring grazing pressure will primarily be carried out through field observations. Field surveying will be undertaken by local workers who live nearby the project area and are assigned management responsibilities. Project site is divided into different (implementation) plots. Each plot is delineated with clear boundaries and assigned a unique code using GIS. Every day, a worker will visit a number of specific plots (depending on the total number and size of plots in each project site). By establishing a daily field survey schedule, the whole project zone will be patrolled over short time intervals in order to identify indicators of grazing activity. Indicators of grazing, apart from spotting animals, also include signs of grazing such as fresh dung and animal tracks or trampled soil and vegetation. Surveys will be carried out using digital sampling forms and a GPS tracker to allow for verification and systemization of

controls. Location, date, time and results of each check will be recorded and stored in a dedicated repository for record keeping, project management and documentation purposes. Grazing observations will be complemented with geo-tagged photographs. When monitoring pressures, recording zeros are as important as recording actual sightings. That is because no signs would reflect successful management and demonstrate progress towards meeting the objective. Particular attention will also be given to existing forest patches inside the valleys (protected under APP) in order to monitor pressures on HCV areas.

**Fire:** The inspector will survey for fire outbreaks in combination with grazing checks. Similarly, date/time, location and result of the surveys will be recorded and stored using digital forms. Two attributes are monitored during fire checks:

- Number and size of fire outbreaks;
- Recent signs of fire (e.g., burned vegetation).

Apart from ensuring that any fire event is noticed quickly, collecting and storing this information in a systematic way, will enable the identification of fire regimes and patterns in the surrounding area of the project. Similarly to grazing monitoring, zeros will be recorded with the same rigorous way as actual events.

For the verification process however, the findings of the surveys will be evaluated using satellite data to verify whether fire occurrence is monitored effectively and to prove that vegetation loss is below the threshold limit of 5% of the project area in one year. The threshold limit was determined according to AR-Tool 08: Estimation of non-CO2 greenhouse gas (GHG) emissions resulting from burning of biomass attributable to an A/R CDM project activity. A high resolution, recent satellite image of the project zone will be acquired and subsequently analysed in order to assess how much of the forest area has suffered vegetation loss from a fire event. The latter will be carried out in each verification period (5 years). In addition, we will use real time satellite monitoring for VIIRS active fire alerts with GFW (https://www.globalforestwatch.org/), as an additional verification and alert measure.

**Fencing:** Fencing the project area is the response measure for addressing grazing pressure. The selected measurement unit for quantifying the indicator are metres of standing fences. The whole perimeter is checked at least once every month. Two attributes are monitored during perimeter checks:

1. Number & length of breaches of the perimeter;
2. Fences in bad or deteriorated condition.

When the field visits show cattle on the project area, that field's perimeter is checked in every case to identify broken fences or other problems causing the cattle outbreak. The check is relatively simple:

a) Surveyor starts on one end of the field perimeter and finds the fence. If the forest is too dense to get to the fence, he finds the first available part.
b) Surveyor walks among the fence and records his tracks via the GPS Logger in a separate file and reports where he finds any damaged or missing fences.
c) The surveyor takes a geotagged photo from every incident. When the fence is missing for a longer distance, a photo will be taken approximately every 25m.
d) All the collected data are stored in a dedicated repository for project monitoring.
e) The findings are reported daily and intervention is planned immediately by the operational team to repair broken fences.

**Fire management plan:** In order to mitigate the risks arising from the use of fire for clearing land in our project region, a comprehensive fire response plan is designed and implemented for each project. Ensuring that the plan is operational at any given time, certain checks need to be in place and undertaken throughout the project lifetime. The checks should aim to assess the readiness of the project to respond to an emergency related to a fire outbreak. Readiness can be evaluated by 2 aspects. First, the availability and condition of equipment and second, the condition of strategic firebreaks around vulnerable parts of the property. Equipment includes pumps, hoses, suits, boots, ear protection muffs, shovels, forks and other firefighting means. These are placed inside the project zone as part of the fire response plan. Firebreaks are thin strips where weeds and grasses are cleared and are strategically placed around areas that are particularly vulnerable to fire risk. Response readiness is assessed once a month. Surveys are undertaken using standard digital forms and all data are stored digitally for record keeping. Observations are complemented with GPS tracking and photographs where needed. Data is recorded in a qualitative, binary manner as indicated below:

1. Availability and condition of equipment (item available: yes/no, item operational: yes/no);
2. Condition of strategic firebreaks around vulnerable points of the property (clear, medium, covered).

Table 23: Biodiversity monitoring provides a summary of the selected attributes, the objectives set for each one and the measurement parameters set.

*Table 23: Biodiversity monitoring*

| Feature | Objective | Type of objective | Unit of measurement | Measurement method | Areas to be monitored | Frequency |
|---|---|---|---|---|---|---|
| Forest cover | Increase forest cover by 35% (compared to current cover) in 30 years inside the project area. | State | Area covered by forest (ha). | Remote sensing complemented with ground truthing measurements. | Implementation areas. | Every 5 years. |
| Native tree species richness | Increase (compared to current conditions) native tree species richness so that at least 25 different tree species can be found inside planted areas by the end of the project's lifetime. | State | Mean number of different tree species. | Permanent plot sampling. | Implementation areas. | Every 5 years. |

| | | | | | | |
|---|---|---|---|---|---|---|
| Populations of threatened tree species | Ensure that survival of A. angustifolia seedlings remains above 80%. | State | Survival rates of A. angustifolia seedlings. | Transect line sampling. | Areas planted with A.angustifolia. | Monthly during the first 3 months;<br>Yearly for the first 3 years. |
| Grazing | No grazers will roam inside project boundaries during the project's lifetime. | Pressure | Number of animals spotted.<br>Recent traces of grazing. | Systematic field surveys. | Entire project zone (particular attention to HCV areas). | Continuous |
| Fire | No more than 5% of total forest cover will be lost due to fire during the project's lifetime. | Pressure | Hectares of burned vegetation. | Remote sensing. | Forested areas (particular attention to HCV areas). | Every 5 years. |
| Fencing | Ensure that fences around the project area boundaries are installed within one year after project implementation and maintained throughout the project's lifetime. | Response | Metres of standing fences. | Systematic field surveys. | Entire project zone. | Continuous |
| Fire management plan | Ensure that a fire response and management plan is implemented and remains operational | Response | N/A | Systematic field surveys. | Entire project zone | Monthly |

| | | | | | | |
|---|---|---|---|---|---|---|
| | for the whole project duration. | | | | | |

### 5.4.2 Biodiversity Monitoring Plan Dissemination (B4.3)

The biodiversity monitoring plan itself, as well as summarised information of the results generated by implementing the monitoring plan, will be published in the online platforms administered by Verra. Such information will be made publicly available and open for receiving feedback and comments.

Furthermore, the insights provided from the monitoring plan will be disseminated among community members and stakeholders related to the project. In addition, the summarised information will be made available to investors and other partners of The Green Branch.

Finally, we will use our own platforms to disseminate the biodiversity monitoring plan and communicate project impact with our audience. These platforms include company pages on social media (e.g. LinkedIn and Instagram), company website, newsletters and other communication material.

## 5.5 Optional Criterion: Exceptional Biodiversity Benefits

### 5.5.1 High Biodiversity Conservation Priority Status (GL3.1)

Several endangered species have been identified within the grouped project region. For example, 30 species have been identified as part of the Territorial Action Plan Campanha Sul and Serra do Sudeste. This includes 14 species of animals (Table 24) and 16 species of plants (

Table 25). From the animals, the iconic pampa cat (Leopardus munoai) stands out, as it has recently been recognised as a unique species (and not a subspecies of a similar cat - Leopardus colocolo- as it was initially established). Other targeted animal species is a small (no bigger than a coin) frog (Melanophryniscus sanmartini) as well as several species of annual fish living only at a certain time of the year in temporary wetlands, such as puddles formed by rainwater. From the plant species, different herbs and shrubs are found in the fields, forests and rocks of the territory. Three of these species are very delicate flowering herbs and are endemic to RS, two are bromeliads and four different cacti, which grow on rocky outcrops and hills. Pavonia secreta, a flowering plant with purple to pink flowers, is endemic to the PAT area (SEMA, 2021).

*Table 24: Endangered fauna species targeted by the Territorial Action Plan Campanha Sul and Serra do Sudeste. Source: Executive summary of the Territorial Action Plan in the regions of Campanha Sul and Serra do Sudeste.*

| FAUNA | | | |
|---|---|---|---|
| **FAMÍLIA** | **ESPÉCIE** | **DESCRIÇÃO** | **CATEGORIA DE AMEAÇA** |
| Bufonidae | *Melanophryniscus sanmartini* | Sapinho-de-barriga-vermelha--do-pampa, pequeno anfíbio, de ocorrência exclusiva às formações campestres | Quase Ameaçada[3,4,7] |
| Felidae | *Leopardus munoai* | Gato-palheiro-dos-pampas, felino que ocorre em campos com mosaicos de vegetação | Em Perigo[3,6] |
| Rivulidae | *Austrolebias arachan* | Peixes exclusivos de áreas alagadas em campos | Criticamente em Perigo[3,5] |
| Rivulidae | *Austrolebias bagual* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada[3,5] |
| Rivulidae | *Austrolebias camaquensis* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada[3,5] |
| Rivulidae | *Austrolebias cheradophilus* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada<br>Criticamente em Perigo[5] |
| Rivulidae | *Austrolebias* aff. *gymnoventris* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada |
| Rivulidae | *Austrolebias juanlangi* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada[5]<br>Criticamente em Perigo[3] |
| Rivulidae | *Austrolebias melanoorus* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada[3]<br>Em Perigo[5] |
| Rivulidae | *Austrolebias nachtigalli* | Peixes exclusivos de áreas alagadas em campos | Criticamente em Perigo[3]<br>Em Perigo[5] |
| Rivulidae | *Austrolebias quirogai* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada |
| Rivulidae | *Austrolebias aff. reicherti* | Peixes exclusivos de áreas alagadas em campos | Não Avaliada |
| Rivulidae | *Austrolebias univentripinnis* | Peixes exclusivos de áreas alagadas em campos | Criticamente Ameaçada[3,5] |
| Rivulidae | *Austrolebias cinereus* | Peixes exclusivos de áreas alagadas em campos | Criticamente Ameaçada[3,5] |

*Table 25: Endangered flora species targeted by the Territorial Action Plan Campanha Sul and Serra do Sudeste. Source: Executive summary of the Territorial Action Plan in the regions of Campanha Sul and Serra do Sudeste.*

| FLORA | | | |
|---|---|---|---|
| **FAMÍLIA** | **ESPÉCIE** | **DESCRIÇÃO** | **CATEGORIA DE AMEAÇA** |
| Araceae | *Mangonia tweediana* | Erva de interior da floresta estacional | Criticamente em Perigo[1] |
| Asteraceae | *Trixis pallida* | Subarbusto a arbusto de campos limpos, afloramentos e platôs rochosos | Vulnerável[1] Criticamente em Perigo[2] |
| Bromeliaceae | *Tillandsia bella* | Bromélia de platôs rochosos | Criticamente em Perigo[1] |
| Bromeliaceae | *Dyckia domfelicianensis* | Bromélia de afloramentos e platôs rochosos | Criticamente em Perigo[1,2] |
| Cactaceae | *Frailea mammifera* | Cacto de afloramentos rochosos | Criticamente em Perigo[1] Em Perigo[2] |
| Cactaceae | *Parodia gaucha* | Cacto de afloramentos e paredões rochosos | Criticamente em Perigo[1] |
| Cactaceae | *Parodia neoarechavaletae* | Cacto de afloramentos e platôs rochosos | Criticamente em Perigo[1] |
| Cactaceae | *Parodia rudibuenekeri* | Cacto de afloramentos e paredões rochosos | Criticamente em Perigo[1] |
| Fabaceae | *Senna nana* | Subarbusto de campos limpos e afloramentos rochosos | Criticamente em Perigo[1] |
| Iridaceae | *Cypella magnicristata* | Erva campestre | Criticamente em Perigo[1] |
| Iridaceae | *Cypella pusilla* | Erva campestre | Criticamente em Perigo[1] |
| Iridaceae | *Herbertia zebrina* | Erva campestre e de afloramentos rochosos | Criticamente em Perigo[1] |
| Malvaceae | *Sphaeralcea bonariensis* | Subarbusto de paredões rochosos | Criticamente em Perigo[1] |
| Poaceae | *Chascolytrum parodianum* | Erva campestre de fendas de rochas | Criticamente em Perigo[1] |
| Malvaceae | *Pavonia secreta* | Arbusto de capoeiras nas fendas e platôs rochosos | Criticamente em Perigo[1] |
| Solanaceae | *Petunia secreta* | Erva dos platôs rochosos da Pedra do segredo e de remanescentes campestres à beira da BR-290 | Criticamente em Perigo[1] |

Furthermore, for the whole Pampa region of RS, several threatened species of fauna have been recorded having different levels of dependence on the ecosystems found in the biome (Pillar et al., 2009).

A list of fauna species that are threatened on a Global level and can be found in the project zone is provided in *Table 27*. With regards to extinction categories, 4 species are classified as “Endangered” and 6 “Vulnerable”.

Moreover, as a biome rich in plant diversity, the Pampa harbours a significant amount of threatened flora species (*Table 26*). According to the proposition of the IUCN (2008), in the category “Endangered” are listed 58 species, in “Vulnerable” 46, in “Critically Endangered” 39 and in “Presumed Extinct” 6 species (Pillar et al., 2009).

Despite the extended list of threatened species (both flora and fauna) there are no readily available, comprehensive data regarding the spatial distribution of their populations. Additionally, there is little information about the trends in their populations. Generally, biodiversity in the region has been under significant pressures related to land use change, pollution, habitat fragmentation and other anthropogenic factors. Thus, general population trends can be assumed to be on a decline. These species are expected to benefit from reduced threats and sustainable land management as a result of project activities, measured against the without-project scenario.

*Table 26: List of threatened flora species found in the project region (source: Pillar et al., 2009)*

| Family/Species | Extinction category |
|---|---|
| **ALSTROEMERIACEAE** | |
| *Alstroemeria isabellana* Herb. | EN |
| **AMARANTHACEAE** | |
| *Alternanthera hirtula* (Mart.) R. E. Fr. | EN |
| *Alternanthera malmeana* R. E. Fr. | EN |
| *Alternanthera micrantha* R. E. Fr. | VU |
| *Alternanthera paronychioides* St.Hil. | VU |
| *Alternanthera praelonga* St.Hil. | CR |
| *Alternanthera reineckii* Briq. | VU |

| | |
|---|---|
| *Alternanthera tenella* Colla | VU |
| *Amaranthus rosengurtii* A. Hunziker | EN |
| *Celosia grandifolia* Moq. | EN |
| *Chamissoa altissima* (Jacq.) H.B.K. | VU |
| *Gomphrena graminea* Moq. | VU |
| *Gomphrena perenis* L. | VU |
| *Gomphrena pulchella* Mart. | EN |
| *Gomphrena schlechtendaliana* Mart. | EN |
| *Gomphrena sellowiana* Mart. | VU |
| *Gomphrena vaga* Mart. | VU |
| *Pfaffia gnaphaloides* (L.f.) Mart. | VU |
| *Pfaffia glomerata* (Spreng.) Pedersen | VU |
| **APIACEAE** | |
| *Eryngium divaricatum* Hook. & Arn. | VU |
| *Eryngium dorae* C. Norman | EN |
| **APOCYNACEAE** | |
| *Mandevilla coccinea* (Hock. & Arn.) Woodson | VU |
| **ASTERACEAE** | |

| | |
|---|---|
| *Acmella pusilla* (Hook. & Arn.) R. K. Jansen | VU |
| *Acmella serratifolia* R. K. Jansen | VU |
| *Calea clematidea* Baker | VU |
| *Calea kristiniae* Pruski | EN |
| *Chaptalia arechavaletae* Hier. ex Arech. | EN |
| *Eupatorium angusticeps* Malme | PE |
| *Gochnatia cordata* Less. | VU |
| *Gochnatia mollissima* (Malme) Cabr. | PE |
| *Gochnatia orbiculata* (Malme) Cabr. | EN |
| *Gochnatia polymorpha* (Less.) Cabr. ssp. *floccosa* Cabr. | VU |
| *Isostigma crithmifolium* Less. | EN |
| *Mikania anethifolia* (DC.)Matzenbacher | EN |
| *Mikania pinnatiloba* DC. | VU |
| *Mikania viminea* DC. | EN |
| *Pamphalea araucariophila* Cabr. | VU |
| *Pamphalea blupeurifolia* Less. | VU |
| *Pamphalea commersonii* Cass. | VU |
| *Perezia multiflora* (Humb. & Bonpl.) Less. ssp. *sonchifolia* (Baker) Vuill. | VU |

| | |
|---|---|
| *Perezia squarrosa* (Vahl) Less. ssp. *squarrosa* | CR |
| *Pamphalea maxima* Less. | VU |
| *Pamphalea missionum* Cabr. | EN |
| *Schlechtendahlia luzulifolia* Less. | EN |
| *Smallanthus connatus* (Spreng.) H. Rob. | VU |
| *Trichocline catharinensis* Cabr. var. *discolor* Cabr. | EN |
| *Trichocline incana* Cass. | EN |
| *Trichocline macrocephala* Less. | EN |
| *Trixis pallida* Less. | EN |
| *Vernonia constricta* Matzembacher | EN |
| *Viguiera guaranitica* Chod. | EN |
| **BORAGINACEAE** | |
| *Moritzia ciliata* (Cham.) DC. | VU |
| **BROMELIACEAE** | |
| *Dyckia alba* S. Winkl. | VU |
| *Dyckia choristaminea* Mez | EN |
| *Dyckia domfelicianensis* Strehl | EN |
| *Dyckia elisabethae* S. Winkl. | CR |

| | |
|---|---|
| *Dyckia hebdingii* L.B.Sm. | VU |
| *Dyckia jonesiana* Strehl | VU |
| *Dyckia julianae* Strehl | VU |
| *Dyckia remotiflora* Otto | VU |
| Dyckia *remotiflora* var. *montevidensis* (C.Koch) Baker | VU |
| *Dyckia vicentensis* Strehl | EN |
| *Dyckia waechteri* Strehl | EN |
| **CACTACEAE** | |
| *Echinopsis eyriesii* (Turp.) Pfeiffer & Otto | CR |
| *Echinopsis oxygona* (Link & Otto) Pfeiffer & Otto | VU |
| *Frailea buenekeri* Abraham | CR |
| *Frailea castanea* Backeb. | CR |
| *Frailea curvispina* Buining & Brederoo | CR |
| *Frailea gracilima* (Lem.) Britton & Rose ssp. *horstii* (Ritter) Braun | CR |
| *Frailea gracillima* (Lem.) Britton & Rose ssp. *gracilima* | EN |
| *Frailea mammifera* Buining & Brederoo | CR |
| *Frailea phaeodisca* (Speg.) Speg. | CR |
| *Frailea pumila* (Lem.) Britton & Rose | EN |

| | |
|---|---|
| *Frailea pygmaea* (Speg.) Britton & Rose ssp. *albicolumnaris* (Ritter) Hofacker | CR |
| *Frailea pygmaea* (Speg.) Britton & Rose ssp. *pygmaea* | EN |
| *Frailea schilinzkyana* (K. Sch.) Britton & Rose | CR |
| *Gymnocalycium denudatum* (Link & Otto) Mittler | CR |
| *Gymnocalycium horstii* Buining | CR |
| *Gymnocalycium horstii* Buining ssp.*buenekeri* (Swales) Braun & Hofacker | CR |
| *Gymnocalycium reductum* (Link) Pfeiffer ex Mittler. ssp. *leeanum* (Hook.) Papsch | EN |
| *Gymnocalycium uruguayense* (Arechav.) Britton & Rose | CR |
| *Opuntia assumptionis* K. Sch. | VU |
| *Parodia allosiphon* (Marchesi) N.P. Taylor | CR |
| *Parodia arnostiana* (Lisal & Kolarik) Hofacker | CR |
| *Parodia buiningii* (Buxb.) N.P. Taylor | CR |
| *Parodia concinna* (Monv.) N.P. Taylor | CR |
| *Parodia crassigiba* (Ritter) N.P.Taylor | CR |
| *Parodia curvispina* (Ritter) D.R. Hunt | VU |
| *Parodia erinacea* (Haw.) N.P.Taylor | EN |
| *Parodia herteri* (Wedermann) N.P.Taylor | CR |
| *Parodia horstii* (Ritter) N.P.Taylor | CR |

| | |
|---|---|
| *Parodia langsdorfii* (Lehm.) D.R. Hunt | VU |
| *Parodia linkii* (Lehm.) R.Kiesling | EN |
| *Parodia mammulosa* (Lem.) N.P.Taylor | EN |
| *Parodia mueller-melchersii* (Backeberg) N. P.Taylor subsp. *gutierrezii* (W.R. Abraham) Hofacker | CR |
| *Parodia neohorstii* (Theun.) N.P. Taylor | CR |
| *Parodia nothorauschii* Hunt | EN |
| *Parodia ottonis* (Lehm.) N.P.Taylor | VU |
| *Parodia oxycostata* (Buining & Brederoo) Hofacker | VU |
| *Parodia penicillata* Fechser & Steeg | CR |
| *Parodia rudibuenekeri* (W.R. Abraham) Hofacker & P.J. Braun | CR |
| *Parodia scopa* (Spreng.) N.P.Taylor ssp. *scopa* | CR |
| *Parodia scopa* (Spreng.) N.P.Taylor ssp. *succinea* (F.Ritter) N.P.Taylor | CR |
| *Parodia stockingeri* (Prestlé) Hofacker & P. J. Braun | CR |
| *Parodia turbinata* (Arech.) Hofacker | CR |
| **CRASSULACEAE** | |
| *Crassula peduncularis* (Sm.) Meigen | EN |
| **FABACEAE** | |

| | |
|---|---|
| *Aeschynomene montevidensis* Vogel | EN |
| *Aeschynomene fructipendula* Abruzzi de Oliveira | EN |
| *Arachis villosa* Benth. | EN |
| *Desmodium venosum* Vogel | PE |
| *Lathyrus acutifolius* Vogel | CR |
| *Lathyrus hookeri* G. Don | PE |
| *Lathyrus paraguariensis* Hassl. | EN |
| *Mimosa alegretensis* Marchiori | VU |
| *Trifolium argentinense* Speg. | EN |
| *Vicia tephrosioides* Vogel | CR |
| *Vicia pampicola* Burkart | PE |
| **GESNERIACEAE** | |
| *Sinningia elatior* (Kunth) Chautems | VU |
| **LAMIACEAE** | |
| *Hesperozygis ringens* (Bentham) Epling | EN |
| *Ocimum procurrens* Epling | CR |
| **MALVACEAE** | |
| *Cienfuegosia drumondii* (A. Gray) Lewt. | EN |

| | |
|---|---|
| *Cienfuegosia hassalerana* Hoccher. ex Chod & Hassler | EN |
| *Cienfuegosia sulfurea* (Juss.) Garcke | EN |
| *Hochreutinera hasslerana* (Hocher) Kraup | VU |
| *Rhynchosida physocalyx* (A. Gray) Frexell | EN |
| *Waltheria douradinha* St. Hil. | VU |
| **MELASTOMATACEAE** | |
| *Tibouchina asperior* (Chamisso) Cogniaux | EN |
| **ORCHIDACEAE** | |
| *Bipinnula montana* Arechav. | EN |
| *Chloraea membranaceae* Lindl. | EN |
| *Geoblasta penicillata* (Rchb. F.) Hoehne ex Correa | EN |
| **POACEAE** | |
| *Agrostis lenis* Roseng., Arr. et Izag. | VU |
| *Aristida constricta* Longhi-Wagner | EN |
| *Briza parodiana* Roseng., Arr. et Izag. | EN |
| *Briza scabra* (Nees ex Steud.) Ekman | CR |
| *Deschampsia flexuosa* (L.) Trin. | EN |
| *Erianthecium bulbosum* Parodi | EN |

| | |
|---|---|
| *Panicum pedersenii* Zuloaga | EN |
| *Panicum aristellum* Doell | CR |
| *Paspalum cromyorrhizon* Trin. | EN |
| *Rhynchoryza subulata* (Nees) Baillon | CR |
| *Setaria paucifolia* (Morong). Lind. | CR |
| *Setaria rosengurtii* Chase | EN |
| *Setaria stolonifera* (Steud.) Griseb. | PE |
| *Setaria hassleri* Hackel | CR |
| *Thrasyopsis jurgensii* (Hack.) Soderstrom ex Burman | VU |
| **POLYGALACEAE** | |
| *Polygala selaginoides* A. W. Ben. | EN |
| **RHAMNACEAE** | |
| *Colletia paradoxa* (Spreng.) Esc. | VU |
| *Discaria americana* Gill. & Hook. | VU |
| **SOLANACEAE** | |
| *Petunia exserta* J. R. Stehmann | EN |

*Table 27: List of threatened fauna species found in the project region (source: Pillar et al., 2009)*

| Group/Species | Global extinction category |
|---|---|
| **Mammals** | |
| Myrmecophaga tridactyla | NT |
| Ozotoceros bezoarticus | NT |
| Mazama gouazoubira | DD |
| Chrysocyon brachyurus | NT |
| Leopardus colocolo | NT |
| Leopardus geoffroyi | NT |
| Puma concolor | NT |
| **Birds** | |
| Harpyhaliaetus coronatus | EN |
| Tryngites subruficollis | NT |
| Amazona pretrei | VU |
| Limnoctites rectirostris | NT |
| Scytalopus iraiensis | EN |
| Polystictus pectoralis | NT |
| Culicivora caudacuta | VU |
| Xolmis dominicanus | VU |
| Anthus nattereri | VU |
| Gubernatrix cristata | EN |
| Sporophila cinnamomea | VU |
| Sporophila palustris | EN |
| Sporophila melanogaster | NT |
| Xanthopsar flavus | VU |
| **Amphibians** | |
| Elachistocleis erythrogaster | NT |
| Melanophryniscus cambaraensis | DD |

As demonstrated in sections 5.1.2 (part High Biodiversity Conservation Priority (Exceptional Biodiversity Benefits, CCB Gold Level)), project activities are expected to trigger the creation of areas with High Biodiversity Conservation Priority. This is resulting from including the Critically Endangered (CR) Araucaria angustifolia in the list of species used during ARR activities. In the first project instance, a total of 1000 A. angustifolia seedlings will be planted over an area of 2.25 hectares. Currently, no A. angustifolia individuals are present within the first project instance boundaries. Thus, their pre-project population status is zero (so is their pre-project distribution area in hectares). High Biodiversity Conservation Priority areas will exist only in the with-project scenario due to the active enhancement of trigger species populations. A distinct biodiversity related project objective has been set for CR species and monitoring their populations is part of the project's biodiversity monitoring programme.

### 5.5.2 Trigger Species Population Trends (GL3.2, GL3.3)

*Table 28: Trigger species trends*

| | |
|---|---|
| Trigger Species | Araucaria angustifolia |
| Population Trend at Start of Project | At the start of the project, no A. angustifolia individuals were present within the boundaries of the first project instance. |
| Without-project Scenario | In a without-project scenario, it is expected that A.angustifolia will remain absent from the project area due to the current land use and management practices. It is thus highly unlikely that, without the project, conditions will be enabled for the encroachment of a CR tree species within the project boundaries. |
| With-project Scenario | A. angustifolia is actively planted during ARR activities of the project. This enables the establishment of a CR endangered species within project boundaries and enhances its overall population in the region. A. angustifolia populations are specifically addressed in the biodiversity related objectives and monitoring programme of the project. Seedlings of the species are monitored in order to ensure that survival rates remain above a certain threshold limit. At the end of the project, it is expected that a population of at least 800 individuals will be established within project boundaries. Thus, a thicket with a viable population of the species is created. |

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